

S
628.168
H2pe
Shelter
July 17, 1985

PLEASE

Montana State Library



3 0864 1006 7396 4

JUL 12 1990

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES



TED SCHWINDEN, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

STATE DOCUMENTS COLLECTION

HELENA, MONTANA 59620

WATER QUALITY BUREAU
Telephone: 444-2406

JUL 22 1985

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

JUL 17 1985

Date

SHELTER BAY ESTATES

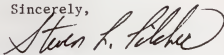
Draft Environmental Impact Statement

Honorable Ted Schwinden, Governor, State of Montana, Helena, MT
Honorable George Turman, Lieutenant Governor, State of Montana, Helena, MT
Department of Fish, Wildlife and Parks, Region One, Box 67, Kalispell, MT
Montana Historical Society, Historic Preservation Office, Attn: David
Schwab, 225 North Roberts St., Helena, MT
Montana State Library, Helena, MT
Environmental Quality Council, Helena, MT
U.S. Environmental Protection Agency, Montana Office, Federal Building, 301
S. Park, Drawer 10096, Helena, MT
University of Montana, Attn: Dr. Carling Malouf, Department of
Anthropology, Missoula, MT
University of Montana, Attn: Dr. Jack Stanford, Biological Station, East
Shore, Flathead Lake, Bigfork, MT
U.S. Fish & Wildlife Service, Federal Building, Room 3035, 316 N. 26th St.,
Billings, MT
District Engineer, Omaha District, Corps of Engineers, Attn: Operations
Office, 6014 U.S. Post Office and Courthouse, Omaha, NE
Honorable John Melcher, United States Senate, Washington, D.C.
Honorable Max Baucus, United States Senate, Washington, D.C.
Honorable Pat Williams, House of Representatives, 1641 Longworth Bldg,
Washington, D.C.
Dr. John F. McGregor, Prospect Heights Medical Center, 401 15th Ave. S.,
Great Falls, MT
Tennie Bottomly, 3729 Hamilton Road, Belgrade, MT
Dr. Kenneth C. Lee, Box 340 Scobey, MT
William A. Spoja, Jr., Box 882, Lewistown, MT
Dr. Richard P. Swenson, 1510 Highland, Helena, MT
J. Howard Toole, 126 E. Broadwater #15, Missoula, MT
Edwin Zaidlicz, 724 Park Lane, Billings, MT
Lake County, Attn: Commissioners, Polson, MT
Lake County, Attn: Land Services Department, Polson, MT
Lake County, Attn: Superintendent of Schools, Polson, MT
Lake County, Attn: Sheriff, Polson, MT
Lake County, Attn: County Attorney, Polson, MT
Lake County Library, Polson, MT
Jack Green II, Box 9410, Missoula, MT
ERA Staninger & Associates, Attn: Ken Staninger, 2806 Garfield, Missoula,
MT
Stensatter, Druyvestein and Associates, Attn: Charles S. Johnson, 3201

Russell Ave., Missoula, MT
 Paul E. Jones, 209 Lakeshore Drive, Kalispell, MT
 Jon L. Heberling, 745 South Main, Kalispell, MT
 Jay Billmeyer, 2191 3rd Ave. E, Kalispell, MT
 Confederated Salish/Kootenai Tribes, Attn: Joe Felsman, Chairman, Box 278,
 Flathead Agency, Pablo, MT
 Flathead Basin Commission, Attn: Elwin Bennington, Box 1039, Polson, MT
 Archie C. McDivitt, Jr., Rollins, MT
 Don Schwennesen, East Shore, Bigfork, MT
 Tribune Bureau, 104 Broadway, Room #7, Helena, MT
 Lee State Bureau, Box 4249, Helena, MT
 Daily Inter Lake, Box 8, Kalispell, MT
 Flathead Courier, Polson, MT
 Kalispell Weekly News, Kalispell, MT
 Environmental Information Center, Box 1184, Helena, MT
 Betty Beal, 301 Caroline Point, Lakeside, MT
 Robert D. Kembel, 901 Kensington, Missoula, MT
 Mack and Agnes Armstrong, Box 147, Rollins, MT
 Flathead Lakers, Inc. Attn: Robert W. Kemler, Director, Box 290, Polson, MT
 Bruce L. Ennis, 3000 Walden Place, Billings, MT
 Jean and David Jones, Box 416, Rollins, MT
 Muriel S. Fischback, Box 348, Rollins, MT
 Felix F. Moran, Box 374, Rollins, MT
 D.L. Erickson, Box 57, Lakeside, MT
 Michael and Gay Naidi, Box 116, Rollins, MT
 Fay Sullivan, Box 25, Rollins, MT
 Dale and Lois Muri, Rollins, MT
 M.J. Galloway, Box 79, Lakeside, MT
 William and Virginia Zelezny, Box 37, Rollins
 Anna J. Murphy, Box 37, Rollins, MT
 Wallace Barce, Box 335, Rollins, MT
 Elma Garber, Box 362, Rollins, MT
 E.D. Baughman, Rollins, MT
 Kathryn Hormold, Box 381, Rollins, MT
 Vida Winkley, Rollins, MT
 Jean Lack, Rollins, MT
 Francis L. Atkins, Rollins, MT
 Edna Hebard, Box 6, Rollins, MT
 Claise London, Box 355, Rollins, MT
 Elsa Swallow, Box 241, Dayton, MT
 Sylvia Oberg, Rollins, MT
 Mabel Chester, Rollins, MT
 Anne Lebkiche, Rollins, MT
 Gem H. Mercer, Polson, MT
 John F. McMillen, 217 E. Washington Center Rd., Fort Wayne, IN
 Dr. and Mrs. John F. Siedensticker, 616 Central Center, Chillicothe, OH
 Edna and Norman Hendriksen, Rollins, MT
 Pearl Steffes, Box 387, Rollins, MT
 Emma and Elgie Sager, Rollins, MT
 Violet Hanson, Rollins, MT
 Howard Thomas, Box 404, Rollins, MT
 Glen Niswanger, 717 90th Place SE, Everett, WA
 Lynn Weaver, Box 386, Rollins, MT
 Charles B. Rogers, Box 353, Rollins, MT
 Rita Crum Lawson, 8313 46th Place W., Mukilteo, WA
 Harris and Moreea Weaver, Rollins, MT

This final environmental impact statement has been prepared for the proposed Shelter Bay Estates subdivision, Lake County, Montana and is being submitted for your information. A final decision on this proposed action will be made 15 days after the date of this document.

Sincerely,

A handwritten signature in dark ink, appearing to read "Steven L. Pilcher". The signature is fluid and cursive, with the first and last names being more prominent.

Steven L. Pilcher, Chief
Water Quality Bureau

TABLE OF CONTENTS

| | <u>Page</u> |
|---|-------------|
| Description..... | 1 |
| Alternatives..... | 4 |
| Referenced Material..... | 4 |
| Substantive Comments and Responses..... | 4 |
| Final Recommendation..... | 20 |
| Appendix | |
| Appendix A..... | 22 |
| Appendix B..... | 26 |
| Appendix C..... | 65 |
| Appendix D..... | 67 |
| Appendix E..... | 71 |
| Appendix F..... | 72 |
| Appendix G..... | 78 |
| Footnotes..... | 80 |
| Bibliography..... | 80 |

Montana Department of Health
and
Environmental Sciences
Final
Environmental Impact Statement

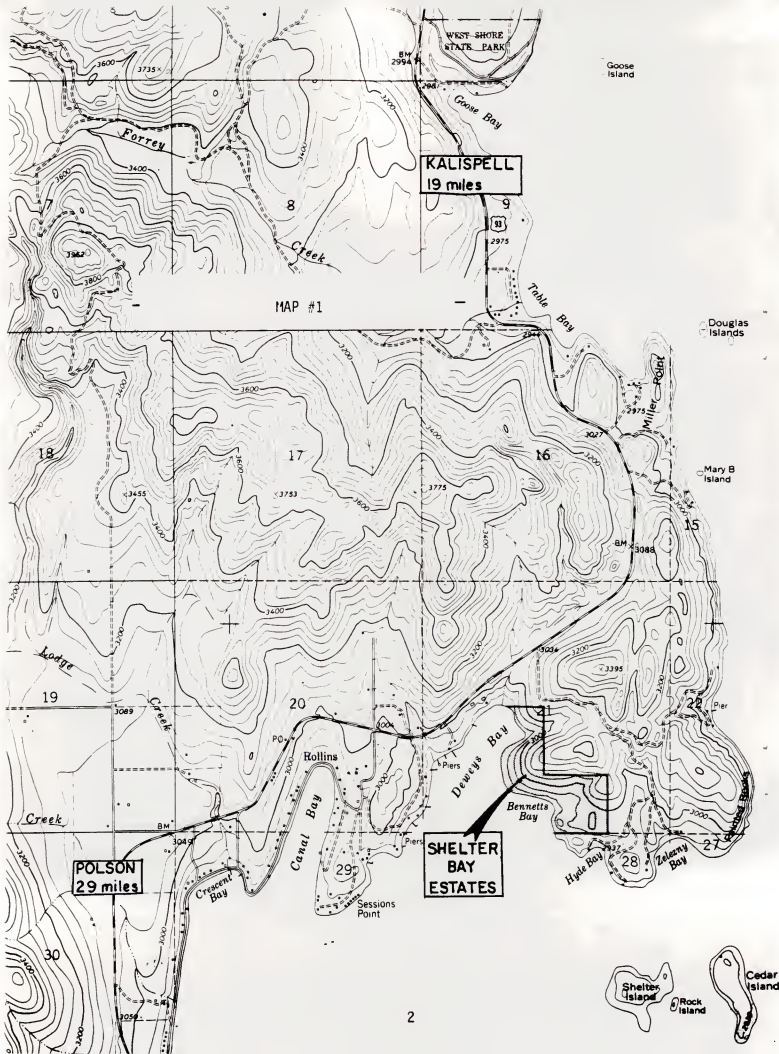
Shelter Bay Estates
Lake County

Pursuant to the Montana Environmental Policy Act, Section 75-1-101, et seq., MCA, the Sanitation in Subdivisions Act, Section 76-4-101, et seq., MCA, and the Water Quality Act, Section 75-5-101, et seq., MCA, the following environmental impact statement (EIS) was prepared by the Montana Department of Health and Environmental Sciences (DHES), Environmental Sciences Division, concerning the request for administrative approval of Shelter Bay Estates, a planned subdivision near Rollins, Montana.

DESCRIPTION

Shelter Bay Estates is a proposed subdivision situated about 1.5 miles east of Rollins, on the shores of Deweys and Bennetts bays in Flathead Lake (Section 21, Township 25 N, Range 20 W) (Map #1).

The 65.73 acre development contains about 3,100 feet of lake frontage. The proposal calls for creating 38 lots, ranging from 2.66 to .49 acres, an average of .84 acres per lot, with an average frontage for the lakeshore lots of 138 feet. The total acreage for lots would be 31.73 acres, with 5.5 acres in roads and 28.5 acres in parks, open space and common facilities. Twenty-one of the lots will be along the shoreline, with the remaining 17 lots situated east of the road running through the subdivision (Map #2).





SHELTER BAY ESTATES

LAKE COUNTY, MONTANA

APRIL 1984

GENERAL PROJECT LAYOUT

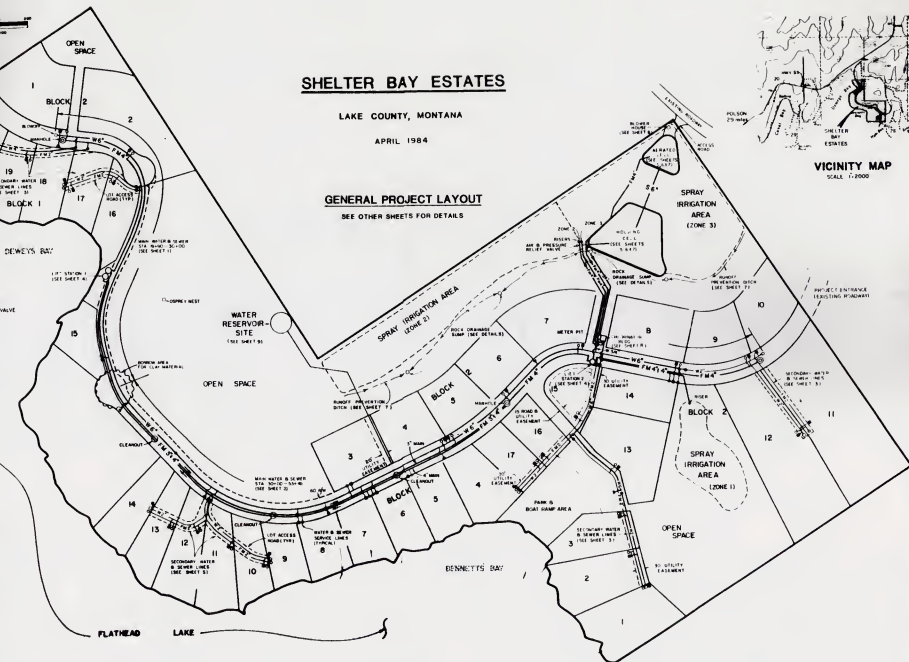
SEE OTHER SHEETS FOR DETAILS



VICINITY MAP
SCALE: 1"=2000'

LEGEND

- W— WATER SERVICE WITH CURB BOX
- S— SEWER SERVICE WITH SHUT OFF VALVE
- FM 4" — SEWER FORCE MAIN
- W 6" — WATER LINE
- P — FIRE HYDRANT
- WATER BULKHEAD
- GATE VALVE



MAP #2

The owners of the development, Jack Green II and Ken Staninger, and their engineers, Stensatter, Druyvestein & Associates, all of Missoula, Montana, received conditional approval from the Lake County Board of County Commissioners for the proposed subdivision---then called Cedar Island Estates---on Aug. 16, 1983. Nearly the same proposal, under the new name of Shelter Bay Estates, was submitted to the DHES for review May 14, 1984. A public meeting was held May 30, 1985, in Polson, Montana, to give interested persons an opportunity to comment on the draft EIS and the proposal in general.

ALTERNATIVES

In the draft EIS, the DHES had two alternatives: 1) Deny or 2) approve the proposed subdivision in accordance with the conditions designed to assure compliance with the laws administered by the DHES. The DHES recommended alternative #2.

REFERENCED MATERIAL

The DHES references all the material in the draft EIS.

SUBSTANTIVE COMMENTS AND RESPONSES

The following includes the public responses to the draft and the DHES's answers to substantive questions and comments. The public comments were sent to the developer June 28, 1985 and their responses were received by the DHES, July 10, 1985 (Appendix A).

Substantive comments and responses include:

1. Will there be offensive odors associated with the wastewater treatment system? (p. 11, Public Meeting Transcript (Appendix B); Ennis' written comments (Appendix C)).

Odors normally associated with facultative lagoon systems should be minimized or eliminated by the design of the Shelter Bay Estates treatment system. Primary treatment is provided by common septic tanks prior to

discharge to the sewage collection system. According to the EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems, up to 45% of the BOD, which is a measure of sewage strength, is removed by the septic tank. Sixty percent of the suspended solids will be removed by the tank.¹

All sewage will be pumped to the aerated treatment cells where it will be retained for at least 15 days while biological treatment takes place to further reduce the BOD and suspended solids to quantities commonly accepted for discharge to a stream. The sewage is then transferred to a holding cell, which is also aerated, where it is retained prior to disinfection and land application. Seasonal odors associated with non-aerated lagoons should be eliminated by maintaining a minimum dissolved oxygen level of 2 mg/l. The aeration system for the biological treatment cells has the capability of supplying 60% more oxygen than necessary per design calculations. According to Water Supply and Pollution Control by Clark, Viessman and Hammer, p. 609, the principal odors associated with wastewater treatment are hydrogen sulfide (rotten egg smell) and organic compounds generated by anaerobic decomposition. Thus, a minimum dissolved oxygen level and proper mixing in the lagoon cells will eliminate anaerobic conditions.

The topography, forest cover and wind patterns should minimize the transfer of odors to nearby property owners if odors should develop from equipment breakdown or improper operation of the facility. The attached map (map #3) indicates the approximate location of the sewage lagoons relative to the nearest home and proposed lots. A significant ridge is shown to the south of the lagoon. Prevailing and localized wind patterns are labeled. Homesites within Shelter Bay Estates are located at least 150 feet from the land application zones and the lagoon. It is common practice in Montana and elsewhere in the United States to spray treated sewage effluent on recreational developments such as golf courses. Therefore, land application of disinfected sewage upon the semi-isolated areas shown should have no groundwater or air quality impacts.

2. How can the adequate operation and maintenance of the wastewater treatment system be assured? (p. 13, Public Meeting Transcript; Ennis' written comments)

PLAT ESTATES

SECTION

R.M.M.

ONTANA

Scale: 1" = 200'
Buffer to homesites with
Shelter Bay $\geq 150'$

66.4 ac.
31.1 ac.
8.8 ac.
22.5 ac.
5.4 ac.
16 ac.
38

movement of
localized winds

IRRIGATION
AC)

REA

BLOCK

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

The operation and maintenance of both the wastewater and water systems will be through a private company created by the land developers. A Third Party Beneficiary Agreement has been executed whereby if the company does not perform its obligations of proper operation and maintenance, the lot owners may bring an action to transfer the operation of the system to a title company or trust company. Therefore, purchasers are automatically assessed a fee for the proper operation of these systems and additional fees may be levied for essential capital improvements if deemed necessary.

MCA 37-42-303 requires that a certified operator be employed to supervise the operation and maintenance of both water and wastewater systems. The DHES certification program establishes five levels of competency and experience for operators. The Shelter Bay Estates operator must have a Class IV water system certification and a Class III wastewater certification.

A preliminary Wastewater Operation and Maintenance (O&M) Manual has been reviewed and approved by the DHES. ARM 16.20.401 requires that a final O&M Manual be submitted to the DHES within 90 days after completion of construction of the project. The final O&M Manual will contain an appendix of manufacturer's information relating to pipe, pumping equipment, aeration equipment, chlorination equipment, meters, testing equipment, lagoon cell liners and irrigation equipment. A complete set of "as-built" plans must accompany the O&M Manual and the as-builts certify that the project has been completed in accordance with approved plans and specifications.

The preliminary Wastewater O&M Manual outlines the operator's requirements and responsibilities, operation standards, safety precautions and a system description. Operation and maintenance logs must be kept to identify any problems and provide a basis for sound operation of the system. A summary of monitoring and testing requirements by the operator is included. During irrigation season, daily checks of chlorine residual and influent/effluent flow must be made. Weekly observation or sampling of dissolved oxygen levels in lagoon cells, pH, coliform bacteria, flow during the winter storage period and liquid temperature will be made. BOD and

suspended solids samples will be taken monthly. Phosphorus and nitrogen will be monitored quarterly.

3. What will be the impact of stormwater runoff upon Flathead Lake? What is the total runoff estimate? What will be the effect of sediments on fisheries? If the water supply system does not provide adequate water quantity for irrigation, then how can reseeding be accomplished in an efficient manner? (p. 17, p. 46, p. 77-78 p. 93, Public Meeting Transcript; Ennis' written comments; Billmayer's written comments (Appendix D)).

Wherever possible, roadways are outsloped so that stormwater runoff will remain dispersed. If flow is not concentrated in a borrow ditch, sufficient soil permeability is present to absorb runoff before it reaches the lake. Existing roadways within the subdivision have been constructed utilizing this same method and no visible erosion or slides have occurred due to runoff. The regrading of the existing roadway should not change this condition. Section 02990 of the project specifications requires reseeding and fertilizing cut and fill slopes of new construction areas. Seed application is to occur in the fall between September 15 and November 15.

The probability of increased stormwater runoff above and beyond current runoff levels from this property has been addressed by the project engineers and those reviewing their submittal. If the "Rational Formula" is utilized to estimate runoff quantities, different quantities can be obtained by varying the coefficient of runoff "c" and the rainfall intensity "i". Depending on the source of one's data, coefficients of runoff between 0.15 and 0.50 could be utilized in estimating existing condition runoff. There are at least 3600 feet of existing bare to gravelled roadway within the subdivision site. Vegetation varies widely from sparse grasses to dense underbrush. Soils are gravelly loams with moderate permeability. An average runoff coefficient for existing conditions should be 0.25 to 0.30.

The new construction of 600 feet of connecting roadway between the cul-de-sacs and 300 feet of roadway leading to the boat ramp will not

increase the runoff coefficient since runoff from these two areas is collected and disposed of through subsurface sumps. In fact, the stormwater collected and disposed of through sumps will decrease the overall surface runoff quantity.

The only probable increase in stormwater quantities would be the result of driveway and home construction. The design engineers addressed this factor in their drainage report where they reference the use of Forest Service type drainage dips to disperse water from the driveways before it can create erosion problems. They also suggested that roof drains be discharged to rock sumps to eliminate potential problems. Most recently, in a letter from Charles S. Johnson, III, of Stensatter, Druyvestein and Associates to Jerry Sorenson, Lake County Planning Director, it was proposed that the following wording be added to the Shelter Bay protective covenants:

"Prior to starting construction of any home, building, or other facility on any lot, the lot owner shall submit a plan for stormwater runoff control to the Architectural Control Committee for review and approval."

It is also expected that homeowners will revegetate a portion of each lot with lawn after house construction is completed. It is anticipated that the completion of a second well will provide enough water to allow for limited irrigation of lawns. However, this can only be determined after the well is drilled.

Based upon the above factors, the DHES estimates a post construction coefficient of runoff of 0.30 to 0.35. Using the DHES storm drainage guidelines which specify a two year, six hour storm event as a basis for rainfall intensity values, an intensity of 0.25 inches per hour is appropriate. One can then calculate a probable overall increase in stormwater runoff of 1.6 cfs for the entire subdivision drainage basin, or about a 20% increase due to development. This quantity is not significant if it is spread over the entire land area where it has ample time to disperse and percolate into the soil.

At two locations, the roadway between the cul-de-sacs and the boat ramp/parking area, land disturbance will occur in close proximity to Flathead Lake. Section 02212 of the contract specifications require that a temporary dike be installed at these locations above the highwater mark to retain any eroded material that may move toward the lake. Section 02005 specifications require that topsoil be removed in the boat ramp area and stockpiled until the improved area is completed. Then topsoil will be placed back over fill and cut slopes and reseeded. A special planting of approximately 50 junipers is required by section 02990 of the contract for the connector road between the cul-de-sacs.

Drainage calculations have been made to determine runoff quantities and ditch cross-sections in the wastewater lagoon area. Since this is the area of greatest disturbance, it will be necessary to collect stormwater runoff and channel it into subsurface sumps. The fill slopes created by the wastewater lagoon dikes will be reseeded and irrigated with treated wastewater.

4. A more detailed analysis of the nutrient impact to Flathead Lake is necessary. What is the range of impacts? Could eroded soils carry sewage into the lake from the land application sites? (p. 20, p. 36, p. 43, p. 49, Public Meeting Transcript; Ennis' written comments; Billmeyer's written comments)

The potential for nutrient impact to Flathead Lake from the Shelter Bay sewage treatment system was investigated using available water quality data and models patterned after EPA publication 660/2-75-022. Past study of Flathead Lake has determined that algal growth is limited by the quantity of phosphorus available. Soil samples were obtained from several test pits in the areas where sewage application is proposed. A total of 20 soil samples were utilized at phosphorus concentrations of 5, 25, 50 and 75 ppm to develop phosphorus isotherms. These isotherms graphically depict the quantity of phosphorus that can be expected to be adsorbed by the soil present at the site.²

Next, the average depth of topsoil and subsoil was estimated based on the numerous test holes excavated and on-site observation. Using average

soil depth of 5½ feet for zone 1 and three feet for zones 2 and 3, and a total net spray application area of 5.5 acres, the quantity of soil available immediately beneath the irrigated sites was established. Then the soil contact area between the sites and the lake was estimated based upon an effluent plume thickness of approximately one foot. It should be noted that this method gives very conservative results since the total spray irrigation area available is 6.8 acres and the soil depths in several areas will exceed the numbers used in calculating soil volume.

Estimates of phosphorus adsorption were calculated at effluent concentrations of 5 ppm and 20 ppm to simulate best and worst case conditions. The 5 ppm concentration of phosphorus within the sewage effluent would represent excellent treatment and removal by the septic tanks and lagoon system. The 20 ppm phosphorus concentration would represent no removal prior to land application. The phosphorus contribution from homes was estimated at a conservative 9.6 pounds per dwelling per year to represent worst case conditions.

Results of these calculations demonstrate that phosphorus should not reach Flathead Lake for a period of 200 years if no removal is achieved through the treatment system. These numbers represent a worst case condition and do not include phosphorus removal by means of plant uptake and precipitation. A more likely time for movement to the lake is 270 years. An upper range of 405 years to 600 years is quite possible. One must also realize that these calculations assume direct movement of phosphorus to the lake which may not be the case.

The above summary clearly indicates that the potential phosphorus impact to Flathead Lake is nonexistent for quite some time and even minimal over a period of several decades. Other sources of phosphorus including natural occurring quantities and existing unregulated sources have a far greater potential to accelerate eutrophication. Per Dr. Jack Stanford's evaluation of the Shelter Bay draft EIS, "the sewage system will adequately serve the development while minimizing the chance of polluting Flathead Lake." (Appendix E)

It is extremely unlikely that soil erosion would occur within the sewage effluent spray irrigation areas. If the application rate maximum of 5.0 inches is achieved during July and each zone is irrigated, an average of four hours per day, except Sunday, the maximum daily application of sewage is 0.30 inches or 0.08 inches per hour. If compared to other similarly designed systems, it can be seen that this is extremely conservative. The O&M Manual requires a daily inspection by the system operator during the irrigation period. There is enough flexibility within the design to allow the operator to manually cease irrigation after a heavy rainfall and then continue operations after sufficient absorption has occurred. The proposed monitoring system will allow early detection of saturated conditions and provide the operator the necessary information to adjust the irrigation pattern. As an additional safety factor, interceptor trenches have been added downslope from spray irrigation zones 2 and 3 to contain any runoff in the unlikely event of a malfunction and total saturation of a spray zone.

The proposed lagoons will have a synthetic plastic liner and clay liner thus eliminating the possibility of sewage effluent movement toward the lake.

5. Since the sewage collection system relies upon power and the water supply system has more than one day's storage, what happens to the sewage system during an extended power outage? (p. 28, Public Meeting Transcript; Billmayer's written comments)

Based upon an average day sewage flow of 300 gallons per day per lot, each individual sewage pumping station has 100 gallons reserve storage capacity between the pump on activation level and the alarm level. This would provide at least eight hours to withstand a power outage. There is another three feet or approximately 300 gallons of storage capacity available above the alarm level before overtopping or spillage would occur. This should provide sufficient time (24 hours) for pump repair or replacement. The operator is required to have a replacement pump on hand.

Those lots that do not have individual lift station pumps have ample storage capacity provided within the two larger lift stations. One can also expect water use to drop during an extended power outage since washing machines and dishwashers would be without hot water. As soon as a lot owner becomes aware of a pumping problem, it is assumed that water use would be curtailed.

6. If there is a slight chance of well pollution, why isn't there a possibility of lake pollution? (p. 21-22, p. 29, p. 34-35, p. 35, Public Meeting Transcript; Ennis' written comments)

Refer to responses to items #1, #2 and #4.

7. The lot density is too great. (p. 41, Public Meeting Transcript)

The preliminary plat setting the density for the proposed subdivision has been conditionally approved by the Lake County Board of County Commissioners (August 16, 1983). This approval is in compliance with the Lake County Subdivision Regulations.

8. The EIS does not adequately address aquatic impacts. There is no range of results of wildlife impact. (p. 44, Public Meeting Transcript; Ennis' written comments)

The DHES' approval is based on compliance with the appropriate environmental health laws administered by the department. Compliance with these laws should result in no added stress by the development to the aquatic community. If violations occur, the laws have provisions for clean-up and enforcement.

The Montana Department of Fish, Wildlife and Parks (DFWP) is the state's expert on wildlife. The evaluations by its terrestrial and aquatic biologists suggest the potential for impacts. With respect to ospreys, the possibilities range from the birds staying and adapting to the changed environment, to the birds leaving. The developers, through restrictive covenants and avoidance of known nests, are attempting to mitigate the situation, thus encouraging the birds to stay. The DFWP indicated that the

birds are "quite tolerant of human activities," so the possibility exists the birds will remain.

As for other terrestrial wildlife, some animals, such as song birds and small rodents, are adaptable to residential development, others, like the small carnivores, such as weasels and bobcats, are less tolerant of man and will likely search for areas providing more seclusion. Deer, as was mentioned by DFWP, will likely continue to frequent the development, and their habitat may be "enhanced seasonally on the irrigated effluent areas, if Section 22 (of the protective covenants that address domestic animals and pets) is maintained and enforced."

The DFWP was concerned that sediment and the construction of shoreline facilities could affect aquatic resources. DHES approval includes provisions to prevent increased sediment from construction of the development and the developers have made provisions in the protective covenants to maintain a 50-foot "natural vegetative buffer between the high-water mark." Additionally, future lot owners must abide by the provisions of Lake County's Lakeshore Construction Permit.

9. The bay (Dewey) is more sensitive than the lake. Significant sedimentation would effect the lake trout spawning. (p. 45, Public Meeting Transcript)

A 1982 study funded by the federal Environmental Protection Agency (EPA) was aimed at gathering information about nutrients and metals in the sediment of Flathead Lake. More than 110 sample locations were established in the lake. Deweys and Bennetts bays were not included in the sampling locations.

According to the study report by Johnnie N. Moore, et. al., on Sediment Geochemistry of Flathead Lake, Montana, all lake bays "...in general, support higher productivity than the open lake and sediment accumulation in those bays is richer in organics and contains higher concentrations of phosphorus."

In addition, the DHES contacted personnel of the University of Montana's Biological Station to see if they had any water quality or phosphorus loading information specifically relating to the bays. They didn't.

The bays, like all the others in the lake, are sensitive with respect to sedimentation. However, compliance with DHES laws is based on precautions being taken to prevent sedimentation. Violations are dealt with if they occur.

The fact that there is not specific data pertaining to the bays does not mean there is no concern on the part of government officials, researchers and the public. Gathering basic information takes time and money. The biological station has served as a focal point for accumulating information relating to Flathead Lake, interpreting it, and drawing conclusions about the condition of the lake. The station has been joined by private individuals, public interest groups and government agencies in attempts to learn more about the lake. Not all the money used in research has been from government sources, private dollars have also been given to gathering basic information.

As private citizens and interest groups become more concerned about certain portions of Flathead Lake, the opportunity exists for them to fund specific studies through the station.

10. The EIS does not address seismic risk - earthquake risk zone two. (p. 47, Public Meeting Transcript)

Although the Flathead Lake region has a long history of earthquake activity, no large earthquakes (of a magnitude greater than 5.5 on the Richter Scale) have occurred. Significant groups of small earthquakes (swarms) have been recorded (mainly on the west side of Flathead Lake) in 1945, 1952, 1964, 1969, 1971 and 1975.

Earthquakes in the area were discussed in a publication produced by Anthony I. Qamar and Michael C. Stickney for the Montana Bureau of Mines and Geology, they said:

Near Big Arm Bay, the seismic activity has been particularly intense. Fault patterns there are complex and no individual fault can be identified with the activity. Earthquake fault plane solutions indicate a variety of mechanisms including strike slip, normal and some reverse faulting (Stevenson, 1976; Qamar and others, 1982). The Mission and Swan faults on the east side of Flathead Lake are very quiet, though they present some bold, steep scarps suggesting relatively recent movement (Pardee, 1950, Konizeski and others, 1968; Stickney, 1980). Of the recognized active or potentially active faults, only the Big Draw fault (in the area of Big Draw Creek, west of Big Arm Bay) shows significant seismicity in its vicinity. This association may be only coincidental (Qamar and others, 1982) since seismicity is not uniform along the length of the fault, and most epicenters lie significantly away from the fault zone.

The many swarms of earthquakes indicate release of considerable tectonic stress in the Flathead Lake region. The risk of earthquakes on the Mission and Swan faults is not known. Though relatively inactive today, these faults may be similar to located portions of the Wasatch fault zone in Utah (Swan and others, 1980), or the San Andreas fault in California. On the other hand, seismicity at Flathead Lake may be limited to minor short faults incapable of producing large earthquakes. Until more is known about the region, it is assumed that it has relatively high earthquake potential.

Recent sub-bottom, seismic profiling of Flathead Lake (Kogan, 1961) shows many deformational structures in the sediments at the bottom of the lake. Some structures may be faults in the sediments, but most appear to be caused by underwater slumping or mass flows possibly triggered by earthquakes. If so, an undisturbed layer of sediments 3 to 10 meters (10 to 33 feet) thick overlying all deformation structures in the lake implies that extremely large earthquakes have not occurred in the last several hundred to a thousand years.³

Using the Modified Mercalli method for measuring intensity (this is an arbitrary scale based on effects), the Flathead Lake area experienced 293 earthquakes between 1869 and 1979. Nine of the recorded quakes occurred in

the Rollins area. The highest recorded intensity was five. At this level people can feel the earth movement, windows can break and plaster may crack. The intensity ranges from a low of one to a high of 12.⁴

According to officials in the Building Codes Division, Montana Department of Commerce, the area has been classified as being an earthquake risk zone #2 (the lowest risk zone is #1). There are no county requirements for special structural specifications for single-family residences due to the risk zone rating, nor are there any special state structural requirements.

11. A cultural resource survey has not been completed. (p. 54, p. 88-90, Public Meeting Transcript)

After the hearing in May, 1985, the developers hired Dr. Thomas Foor and Dr. Dee Taylor of the University of Montana to conduct a pedestrian survey for cultural resources on the site of the proposed development. The archaeologists conducted the survey on June 14, 1985.

In their report (See Appendix F) they concluded that no mitigation or further testing appeared necessary. They did add that if during construction any subsurface cultural materials should be encountered that an archaeologist be notified so proper evaluations, recommendations and procedures could be done.

12. Economic impacts were not addressed sufficiently. (p. 54, Public Meeting Transcript)

Economically, the proposed development can be considered from two perspectives. One would be as part of the overall economic development in the Flathead Lake area and the other would be as a source of tax revenue for Lake County.

As a contributor to the recreational community, Shelter Bay Estates would add to the cumulative impact of recreation and tourism in general. The importance of money generated from this part of the economic community

was discussed in the Flathead River Basin Environmental Impact Study Final Report, funded by EPA, and published June 30, 1983.

Research done as part of the study concluded that the combined preservation and recreational values of the Flathead Lake and River system are estimated to equal about \$102 million annually. Recreational value, directly expressed through the travel costs incurred by visitors, equals \$5 million. The reports said this does not include many recreation-related economic benefits, such as the heightened value of lakeshore property or the positive impact of tourist dollars to the local economy. It added that the recreation valuation for the Flathead system is based on "state-of-the-art" methods, and provides an objective measure which can be compared to other water resources nationwide.

The report goes on to state, "Preservation value greatly exceeds recreational use value for the Flathead system. The public would be willing to pay an estimated \$97 million annually to protect water quality values; conversely, the public would suffer a \$97 million loss if Flathead waters were degraded beyond acceptable water quality standards."

As a tax resource for Lake County, the proposed development--over a period of time--may cost more than it generates in revenue, according to an evaluation done by county officials in 1983. The draft EIS references this work, but did not include it verbatim because the analysis was done for the initial proposal, Cedar Island Estates (Appendix G). Although the figures have changed with the resubmittal of Shelter Bay Estates, they do serve as the basis for the county's contention that it is "...generally accepted that residential development does not pay its own way in relation to its demand on services." This does not mean the proposed development will fall into this category, it merely is to underscore that the initial generation of revenue from changing the taxable valuation from a lower to higher bracket can, over a long period to time, cost more in public services than is brought in through tax revenues.

13. Has a bonding system been established to assure completion of the project? (p. 58, Public Meeting Transcript)

Section 76-3-507 of the Subdivision and Platting Act states that "local regulations may provide that, in lieu of completion of the construction of any public improvements prior to the approval of the final plat, the governing body shall require a bond or other reasonable security, in an amount and with surety and conditions satisfactory to it, providing for and securing the construction and installation of such improvements within a period specified by the governing body and expressed in the bonds or other security."

In other words, if the Lake County Commissioners do not require that all utilities be completed before the plat is filed, they must require some means of security for the completion of improvements. This procedure has been accomplished at the local government level.

14. The land application area is too close to Jones' well. Wind pattern's may cause odor problems. (p. 60-70, Public Meeting Transcript)

Refer to item #1 response.

15. The water system output is quite a bit less than the 500 gpm flow referenced back in 1983 during planning hearings and this may jeopardize the ability to fight fires. (p. 80, Public Meeting Transcript)

The Shelter Bay Estates water system is not capable of providing flows that meet the minima outlined by the State Fire Marshall for new subdivisions. The minimum required fire flow for lots of the size in Shelter Bay Estates is 500 gallons per minute for two hours. The Shelter Bay water system could conceivably produce 500 gallons per minute, but only for less than an hour. The water system therefore can be approved only as a system that can fill fire tank trucks from small post hydrants. The department cannot require that a new water system meet the State Fire Marshall's minimum flow requirements. However, if a water system capable of providing fire protection is proposed by the owner, then the system must be capable of providing the minima required by the State Fire Marshall.

16. The connecting road between the cul-de-sacs will create a significant impact. (p. 83, p. 93, Public Meeting Transcript)

Refer to item #3.

17. The water balance of the sewage holding pond is based upon questionable data. (Billmayer's written comments)

The design engineer's calculations of the sewage holding cell volume were based upon extreme weather conditions. The annual precipitation value of 24 inches represents the wettest year on record and encompasses a 44 year span of data. The annual evaporation rate of 35 inches is thought to be representative of the west shore of Flathead Lake.

Using this precipitation and evaporation data, it can be demonstrated that 21,755 gallons of treated sewage would remain in the holding cell during the wettest year yet recorded. It is most likely that the system operator would not retain the 21,755 gallons until spring, but rather would apply this quantity to the land during October through November, if weather permitted. This would result in the application of only 0.13 inches of additional effluent.

Even if one were to calculate the month to month water balance using an evaporation rate of 29.72 inches from the Hungry Horse area, the resulting excess would be equivalent to 0.54 inches of additional effluent or a 2% increase. Furthermore, based upon an average annual precipitation of 20 inches, which has only been exceeded four times in the past 44 years, the holding cell actually has 30,625 gallons of excess storage capacity. Thus, the proposed design offers enough flexibility to withstand the most severe weather conditions while still providing adequate sewage treatment year round.

FINAL RECOMMENDATION

The DHES' final recommendation, which is the same as the recommendation in the draft EIS, is for conditional approval of the proposed Shelter Bay Estates subdivision.

APPENDIX

APPENDIX A

LAW OFFICES/ GREEN, MacDONALD & KIRSCHER

Jack L. Green II, P.C.
Donald MacDonald IV, P.C.
Ralph B. Kirscher
Joan B. Newman

July 9, 1985

RECEIVED

JUL 10 1985

Thomas M. Ellerhoff
Environmental Coordinator
Department of Health & Environmental Sciences
Cogswell Building
Helena, Montana 59620

**MDHES
Environmental Sciences Div.**

RE: Shelter Bay Estates Final EIS,
response to June 28, 1985, letter

Dear Mr. Ellerhoff:

I am writing in regard to your letter of June 28 concerning the final Environmental Impact Statement. I had Stensatter Druyvestein & Associates prepare answers to some of the substantive comments from the public hearing on the Shelter Bay Estates subdivision. Enclosed herewith please find the original of this letter pursuant to my conversation with you. I do not believe it is necessary to discuss other items contained in the 17 items listed as they were dealt with at the subdivision review level at great length pursuant to a criteria set forth by the subdivision and platting act. Accordingly, no comment will be made regarding these items as I believe it would be inappropriate to review the same through the Environmental Impact Statement process.

If you have any questions regarding the above, please do not hesitate to contact me. Should you have any questions concerning Stensatter Druyvestein & Associates review of the 17 substantial comments, please do not hesitate to contact Charles S. Johnson.

Sincerely,



JACK L. GREEN II

JLG/cb
Enclosure
cc Stensatter Druyvestein & Associates

July 9, 1985

Gary A. Stensatter
Res 406/251-3527Terry L. Drugvestein
Res 406/251-2758

1115.1

Mr. Jack L. Green II
Green, MacDonald & Kirscher
127 East Front Street, 2nd Floor
Box 9410
Missoula, Montana 59807-9410

Dear Jack:

In response to the "substantive" comments that were attached to the Department of Health and Environmental Sciences letter of June 28, 1985 concerning the EIS for Shelter Bay Estates, we would offer the following comments on the items that pertain to engineering matters:

1. Offensive Odors from the Wastewater Treatment Facility. This question has been addressed in past correspondence to both the DHES and Lake County. The entire treatment system to include the holding pond will be aerated. The capacity of the aerator is in excess of the oxygen demand, and therefore odors should not be a concern in a system of this type.
 2. Operation and Maintenance of the System. The operation and maintenance of both the water and sewer systems will be conducted by a State of Montana DHES certified operator. Also upon completion of the construction project the operation and maintenance manual (which is now in draft form) will be completed and made available for the use of the operator.
- Further, if the requirements for operation and maintenance of either the water or sewer system are not met, the State of Montana can, by law, take steps to insure the systems are adequately operated.
3. Stormwater Runoff. This concern has also been addressed in past correspondence to the DHES. We feel that the measures that will be taken both during and after construction will prevent the introduction of sediments into Flathead. Items have been incorporated into both construction specifications and the covenants to control runoff.

~ Roadway and lagoon slopes will be seeded to help prevent erosion. No special provision will be made to irrigate these slopes, but since the slopes will probably be seeded in the fall, it is felt the natural precipitation will be sufficient to start and maintain the plant growth. Future irrigation of some lagoon slopes will be provided through spray irrigation.

APPENDIX A

LAW OFFICES/ GREEN, MacDONALD & KIRSCHER

Jack L. Green II, P.C.
Donald MacDonald IV, P.C.
Ralph B. Kirscher
Joan B. Newman

July 9, 1985

RECEIVED

JUL 10 1985

Thomas M. Ellerhoff
Environmental Coordinator
Department of Health & Environmental Sciences
Cogswell Building
Helena, Montana 59620

**MDHES
Environmental Sciences Div.**

RE: Shelter Bay Estates Final EIS,
response to June 28, 1985, letter

Dear Mr. Ellerhoff:

I am writing in regard to your letter of June 28 concerning the final Environmental Impact Statement. I had Stensatter Druyvestein & Associates prepare answers to some of the substantive comments from the public hearing on the Shelter Bay Estates subdivision. Enclosed herewith please find the original of this letter pursuant to my conversation with you. I do not believe it is necessary to discuss other items contained in the 17 items listed as they were dealt with at the subdivision review level at great length pursuant to a criteria set forth by the subdivision and platting act. Accordingly, no comment will be made regarding these items as I believe it would be inappropriate to review the same through the Environmental Impact Statement process.

If you have any questions regarding the above, please do not hesitate to contact me. Should you have any questions concerning Stensatter Druyvestein & Associates review of the 17 substantial comments, please do not hesitate to contact Charles S. Johnson.

Sincerely,


JACK L. GREEN II

JLG/cb
Enclosure
cc Stensatter Druyvestein & Associates

July 9, 1985

Gary A. Stensatter
Res. 406/251-3527Terry L. Drugvestein
Res. 406/251-2758

1115.1

Mr. Jack L. Green II
Green, MacDonald & Kirscher
127 East Front Street, 2nd Floor
Box 9410
Missoula, Montana 59807-9410

Dear Jack:

In response to the "substantive" comments that were attached to the Department of Health and Environmental Sciences letter of June 28, 1985 concerning the EIS for Shelter Bay Estates, we would offer the following comments on the items that pertain to engineering matters:

1. Offensive Odors from the Wastewater Treatment Facility. This question has been addressed in past correspondence to both the DHES and Lake County. The entire treatment system to include the holding pond will be aerated. The capacity of the aerator is in excess of the oxygen demand, and therefore odors should not be a concern in a system of this type.
2. Operation and Maintenance of the System. The operation and maintenance of both the water and sewer systems will be conducted by a State of Montana DHES certified operator. Also upon completion of the construction project the operation and maintenance manual (which is now in draft form) will be completed and made available for the use of the operator.

Further, if the requirements for operation and maintenance of either the water or sewer system are not met, the State of Montana can, by law, take steps to insure the systems are adequately operated.

3. Stormwater Runoff. This concern has also been addressed in past correspondence to the DHES. We feel that the measures that will be taken both during and after construction will prevent the introduction of sediments into Flathead. Items have been incorporated into both construction specifications and the covenants to control runoff.

Roadway and lagoon slopes will be seeded to help prevent erosion. No special provision will be made to irrigate these slopes, but since the slopes will probably be seeded in the fall, it is felt the natural precipitation will be sufficient to start and maintain the plant growth. Future irrigation of some lagoon slopes will be provided through spray irrigation.

4. Could eroded soils carry nutrients to the lake from the land application areas? Due to the very low application areas from the lake, it is very unlikely that runoff could ever occur which would carry nutrients to the lake. Further, there is no evidence of soil erosion in the area now, thus indicating that past rainfalls haven't been intense enough to cause erosion.
5. What happens to sewage during an extended power outage? This item has also been addressed in past correspondence. Provision has been made to both the individual and central lift stations to accomodate sewage flow for approximately an eight hour period.
6. Could the well or lake become contaminated? A previously submitted geologic report indicates that because of the nature of the soils and rock in the Shelter Bay area, there is little chance of contaminants reaching the well or the lake. Further, the lagoons will be sealed with both clay and synthetic liners, and water will be applied at such low rates to the application area that it is very unlikely that movement of any water from the area will be experienced. Also, interceptor trenches will be placed along the upper irrigation areas to catch any runoff that may occur.
7. Lot density is too great. The preliminary plat setting the density for this subdivision has previously been approved by the Lake County Commissioners.
8. No comment.
9. No comment.
10. Seismic Risk. No special provision has been made in the design of the water or sewage systems for earthquake activity.
11. Cultural Resource Survey. A cultural resource survey was conducted by professors from the University of Montana. Their findings proved negative, and their report was previously submitted.
12. No comment.
13. No comment.
14. Proximity of land application system to Jones' well. Again, this item has been addressed in previous correspondence. There is approximately 250 feet between the application area and the Jones' well. This distance coupled with the low surface application rates should be sufficient to safeguard the well.
15. Water Supply. The water supply will consist of two wells, a 27,000 gallon storage facility, and fire hydrants (post type). While the system will not be rated for a full 500 gpm - 2 hour fire flow, the hydrants and water system is available for use by the local rural fire department.
16. Connecting road between the cul-de-sacs. The construction of the section of roadway was requested by the Lake County Commissioners.

17. Water balance for sewage holding pond. This item has also been addressed in past correspondence. The balance indicates that even in the wettest of years (24 inches), the water can be adequately disposed of by increasing the design amount of land application by a very small percentage (approximately 2%).

Jack, these comments are not detailed, as these same items have been previously expressed as concerns by the DHES, and addressed in more detail in past correspondence to the DHES and Lake County. If you have any questions concerning this response please don't hesitate to call me.

Sincerely,



Charles S. Johnson III, P.E.

CJ/eb

APPENDIX B

BEFORE THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

OF THE STATE OF MONTANA

In the matter of the Draft)
Environmental Impact Statement)
re. SHELTER BAY ESTATES,)
Lake County)
_____)

TRANSCRIPT OF HEARING

May 30, 1985
Polson, Montana

I N D E X

Page

| | |
|---|-----|
| OPENING STATEMENT BY MR. CROWLEY | 2 |
| TESTIMONY BY JIM McCAULEY | 5 |
| Questioning by members of the audience | 9 |
| TESTIMONY BY JIM MELSTAD | 24 |
| Questioning by members of the audience | 28 |
| TESTIMONY BY JON L. HEBERLING | 41 |
| TESTIMONY BY PAUL E. JONES | 57 |
| TESTIMONY BY JIM McCAULEY (CONTINUING) | 71 |
| TERTIMONY BY TERRY DRUYVESTEIN | 74 |
| TESTIMONY BY ANN BALDWIN | 75 |
| TESTIMONY BY JERRY SORENSEN | 76 |
| TESTIMONY BY HELEN JONES | 78 |
| TESTIMONY BY JERRY H. WINKLEY | 79 |
| TESTIMONY BY JOANNE M. KEMBEL | 81 |
| TESTIMONY BY ROBERT W. KEMLER | 82 |
| TESTIMONY BY FELIX F. MORAN | 83 |
| TESTIMONY BY ROBERT D. KEMBEL | 85 |
| TESTIMONY BY LAURENCE KENMILLE | 87 |
| TESTIMONY BY LYNN WEAVER | 91 |
| TESTIMONY BY TERRY DRUYVESTEIN (CONTINUING) | 92 |
| TESTIMONY BY BILL OSBORNE | 97 |
| CERTIFICATE OF REPORTER | 100 |

Other discussion participants:

Page

| | |
|---------------------------|----|
| JOYCE VAN VOAST | 9 |
| RUSSELL STEEN | 28 |
| LLOYD JACKSON | 34 |
| ED THOMAS | 85 |
| PADDY TRUSLER | 85 |

1 things. But that's -- you know, we really don't look at that
2 when we review a system like this. I don't know of any
3 system in the state that's designed to do that specifically,
4 unless it's an industrial system. And here we're talking
5 about domestic household sewage.

6 Q MR. JONES: Question. My name is Paul Jones.
7 Jim, is there any odor associated with this system?

8 A MR. McCAULEY: There is always a potential for odor
9 from a sewage treatment lagoon. It's an open surface and
10 you're putting -- you're not dumping raw sewage into the cell
11 but you're dumping partially-treated sewage in that it's only
12 been through a septic tank, which will just remove the solids
13 for the most part. So the idea is that enough air is being
14 applied and there's enough mixing within that cell that there
15 should be very little odor potential.

16 Q MR. JONES: But there is a possibility of odor
17 from the lagoon?

18 A MR. McCAULEY: Sure.

19 Q MR. JONES: Okay, is there any odor potential from
20 the aerated areas?

21 A MR. McCAULEY: From the spray irrigation areas?

22 Q MR. JONES: The spray irrigation.

23 A MR. McCAULEY: Not -- well, I wouldn't say there's
24 absolutely zero. There would be very little. By that time,
25 it's been through --

26 Q MR. JONES: What kind of odor is it? That very
27 little odor.

28 A MR. McCAULEY: Well, I'd describe it, maybe a musky

1 Q MR. JONES: And the last question is, if the
2 system does not work because of any number of reasons, what
3 would the plan be for sewage? If the system doesn't work for
4 any number of reasons, what would happen to the sewage?

5 A MR. McCAULEY: Well, there --

6 Q MR. JONES: We have a system up in Columbia Falls
7 that didn't work, where the sewage went into the river.
8 Where would the sewage go here if the system didn't work?

9 A MR. McCAULEY: Okay, there is not any alternative
10 system as such proposed. It's like any other I guess large
11 subdivision, large -- small town, large town, anything else.
12 If it doesn't work, you have to define some other solution,
13 whatever it may be. One thing I would say about the treat-
14 ment part of it, I don't think there's much of a chance of it
15 failing in terms of not providing the treatment. Poor
16 operation, poor maintenance could cause odor problems. And
17 one of the things we do is that we ask, whenever there is a
18 lagoon system, that they have a quarter-mile radius of
19 separation from existing homes and from potential building
20 sites, and in this case, there was an easement obtained from
21 the adjacent property owner within that radius to protect
22 anyone from odors.

23 Q MR. WINKLEY: Jerry Winkley. My concern here is not
24 necessarily the original installation and operation of the
25 system, but what's going to happen five, ten, fifteen years
26 up the road. You mention a full-time operator. I'd like to
27 see some definition of what a full-time operator means. Is
28 that a resident? Is it somebody that checks the system

1 the first people to be affected or the people who will be
2 living on lots within the subdivision are the closest so I
3 would assume they would, if it was a problem to them, take
4 the initiative to make sure the system was operated properly.

5 Q MR. HEBERLING: Jon Heberling. The copy of the
6 drainage plan map that we got was pretty much unreadable and
7 I'd like to ask you to quickly describe the drainage plans,
8 where the rock sumps are, what areas they collect from, what
9 they do.

10 A MR. McCAULEY: Okay, maybe I can use this site plan
11 to kind of describe the situation. For the most part, the
12 roads are existing. The small portion through here has to be
13 constructed still, and the drainage -- the roads are basical-
14 ly out-sloped, in that there is a -- there's not specific
15 ditches to collect drainage or storm sewers or collection
16 devices that would concentrate a great quantity of water in
17 one specific area like you might have in town here. So it's
18 mostly these roads that slope, the base of the road would be
19 downward sloping and any rainfall off the highways, the
20 roadways, would flow into the adjacent lots where it would be
21 absorbed into the soil. There is a collection ditch along
22 this new section of road. It's a fairly steep area where
23 they're cutting this road into the bank, so they are collec-
24 ting the drainage along the cut area of that road and there's
25 a sump approximately in this location. I don't know the
26 exact location. I think you can find it on the plans, I'm
27 sure, on one of the other plan sheets. Also, there's a
28 collection area at the public boat docking facility. I don't

1 agency, we have enforcement authority under state law to
2 issue orders to anyone who is operating a system that is not
3 in compliance with plans and specifications that were ap-
4 proved, so even if the homeowners bailed out of this one or
5 there was lack of interest, there's still going to be this
6 company or this third-party beneficiary, or there's still
7 enforcement authority under the state. We can order whoever
8 is owning and operating that system to take corrective
9 measures to make sure it operates right or to shut it down.
10 And we have done that in some cases.

11 Q MR. HEBERLING: I'll ask just one more. At page 13 of
12 the EIS, there's a statement that even using conservative
13 estimates, the Department doesn't expect nutrient impact on
14 Flathead Lake. Is that based on the 50-year phosphorus
15 migration, and if so, is that based on Dr. Running's
16 2.8 inches of precip to groundwater table?

17 A MR. McCAULEY: No, I can clarify that. It's more
18 conservative than you might think. The way we looked at this,
19 and there's reference to modeling, and Dr. Horpestad, Abe
20 Horpestad, who -- I don't know if you know him or not; he
21 works for the Water Quality Bureau -- researched this. First
22 of all, what we decided was, let's take, for example, remove
23 the phosphorus -- or, remove from our consideration phospho-
24 rus, which may be taken out in the holding cell, in the
25 aerated cell, from that treatment part of the system, and
26 also any phosphorus that might be removed in the septic
27 tanks. There's going to be some reduction; I don't know
28 exactly what percentage of the phosphorus in the sewage will

1 be reduced prior to spraying. But we just said, okay,
2 whatever that is, ten, twenty, thirty percent; throw that
3 away. Let's assume 100 percent of the phosphorus is applied
4 to the soil. Okay, taking that into consideration, we also
5 said, let's forget the plant uptake, or what the trees, the
6 vegetation will use. We'll throw that out and not give them
7 any credit for that. And we'll just take 100 percent of what
8 goes into the soil; 100 percent of the phosphorus in the
9 sewage is applied to the soil itself. Nothing to evaporation
10 or anything else. Given that quantity and figuring maximum
11 build-out of all -- actually, the design was based on 43 lots
12 instead of the 38 that we're being asked to approve right
13 now. Based on 43 lots, and I would say, conservative esti-
14 mates of the amount of phosphorus generated, figuring maximum
15 flows, peak flows, year-around resident, full-time occupancy
16 of the lots, and everything, we found that the soils, based
17 on the soil absorption isotherms -- now, this is just a test
18 that's run on the soils in the laboratory; I think it was
19 done in Idaho at the University of Idaho Lab? Moscow?
20 Right? Okay. My recollection was that, yes. So we took
21 those analyses of that and figured that there was enough soil
22 here, the type of soil to attenuate or to stop the movement
23 of phosphorus to the lake for a 50-year-plus period. That's
24 what we've set as our minimum. In actuality, we have no
25 guarantee that sewage from any of these areas will move to
26 Flathead Lake in the first place. I know if you read the
27 section about the water system, the well that's drilled here
28 is very deep. There's no definite connection, unless it's

1 through fractured bedrock or some nature of this, that we
2 know that every bit of the sewage will even flow to Flathead
3 Lake in the first place. So I think we've taken the most
4 conservative numbers all the way around and said, gee, if
5 nothing works here, we could spray it to the land and it's
6 still going to be over 50 years before you even see any
7 phosphorus in Flathead Lake.

8 Q MR. HEBERLING: Did you use the 2.8 inches, which was
9 Dr. Running's number?

10 A Mr. McCAULEY: No. No, we said if we sprayed every-
11 thing the full 22 inches a year.

12 Q MR. HEBERLING: Well, you have to make an assumption
13 of how much of the amount that's sprayed on gets to the
14 groundwater. Are you assuming --

15 A MR. McCAULEY: Say all of it does.

16 Q MR. HEBERLING: -- all of it does?

17 A MR. McCAULEY: Say all of it does.

18 Q MR. HEBERLING: ...And how much are you assuming -- how
19 many inches are you assuming you're spraying on it?

20 A MR. McCAULEY: The annual application rate was 22
21 inches, 22.6. I don't recall the exact number. Somewhere in
22 that range.

23 Q MR. HEBERLING: Do you figure annual precip at 15?

24 A MR. McCAULEY: Yes. Well, during the spring season.
25 This is just during the seven-month period that it would be
26 applied. On a twelve-month basis, I think the maximum
27 precipitation that has occurred was 24 inches. But that was
28 the wettest ever recorded and that's 16 inches during the

1 developer's hydrogeologist, was that we have no way -- we
2 have no way we can comfortably say to the developer, "because
3 the location looks bad you have to abandon the well and drill
4 in another location." We feel comfortable enough with the
5 location that we're going to go ahead and approve the lo-
6 cation along with another well, a second well, and we feel
7 that there is virtually no possibility that the well will
8 become contaminated. Other than that, the system is pretty
9 straightforward and simple and as we were talking before, a
10 certified operator has to be available to the water system at
11 all times, even though it's not as complex as the sewage
12 system. With that, I'll open it up.

13
14 Questioning by members of the audience:

15 Q MR. STEEN: I'm Russell Steen, and I'm interested
16 in this because of fire protection. I think probably we've
17 covered this, but what are the sizes of those tanks that will
18 collect the water?

19 A MR. MELSTAD: Each is about, I believe, 13 1/2 thou-
20 sand gallons. There's two tanks and total capacity, I think,
21 is about 27,000 gallons. And that's more than enough to
22 provide one day's domestic flow in case of power outage, and
23 as I was saying before, it is a domestic-flow system. It's
24 not a system designed to provide flows to pumper fire trucks.

25 Q MR. STEEN: We have a little volunteer fire
26 department and I was interested in it because we certainly
27 want to take care of any possibility of recourse to our
28 department at that particular point, and to come and do what

1 we can. As I understand, we can draw water from the 2,700
2 gallon -- or, 27,000 gallon --

3 A MR. MELSTAD: Well, I guess it kind of depends on
4 your capacity to put out water after you've loaded your
5 trucks, and what-not. You know, I can't imagine that the
6 homeowners would want you to drain your tanks entirely, and I
7 don't know that you could do that even if you had a fire. I
8 guess in my mind, I figure that if you're coming and getting
9 a load of water and going wherever you had to go and coming
10 back, in the meantime, the tank should have had a chance to
11 recover, at least slightly.

12 Q MR. KEMBEL: Bob Kembel. If there's a slight
13 chance of a well being --

14 REPORTER: I'm sorry, Sir. Could you stand for
15 me so I can hear you better?

16 MR. KEMBEL: Bob Kembel. If there's a slight
17 chance of a well being polluted, why wouldn't the lake have
18 the same chance?

19 A MR. MELSTAD: Okay, when the hydrogeologist looked
20 at the well, the locations where water was encountered were
21 below the lake basically, and in fact, when the water-bearing
22 zones were encountered -- the ones that they wanted to use
23 were encountered, the water came up to within I believe about
24 25 feet of the surface, implying that the well is obviously
25 supplied by artesian pressure from below, and if the water is
26 getting there from the lake, it's getting there from some-
27 where further away. It's not coming directly from the lake.
28 Even if it was coming directly from the lake, the water level

1 A MR. McCAULEY: I don't know if -- did the hydrogeo-
2 logical report address that? I don't recall --

3 MR. MELSTAD: I don't remember seeing that from the
4 well logs. I don't remember seeing any clay layers. There's
5 a lot of rock.

6 MR. CROWLEY: I think, unless there are any further
7 questions on the water system and the presentation
8 that was made -- we have one more question back
9 there? Yes, Sir?

10 Q MR. JACKSON: I'm Lloyd Jackson, Shoreline Protec-
11 tion Office. I know for a fact that about 70 percent of the
12 people on the south half of the lake are using water for
13 drinking and purposes in their house, and you say that well
14 water is to be more stringent than lake water? And these
15 people are using that water?

16 A MR. McCAULEY: Yes, I would say -- as a matter of
17 fact, now, if you're taking water from the lake, you're not
18 drinking it straight from Flathead Lake. It's being put
19 through a treatment plant where it isn't just --

20 Q MR. JACKSON: Negative. Negative. They're pumping
21 it straight out of the lake. It's piped out of there. Now,
22 we are trying to maintain water quality in Flathead Lake and
23 if we dump this stuff in there, we're just going to wreck it
24 and that's what we're trying to get around right now. I
25 think that's what all the questions are about.

26 A MR. McCAULEY: I understand your concern. I guess --
27 maybe I'm mis-stating things. The potential of adding any
28 pollution in terms of bacteria, virus, nutrients, phosphorus,

1 nitrogen, or anything, is very minimal with this type of
2 treatment system. I guess I would go as far as to say the
3 only thing that would not provide better treatment than this
4 system would be to have no houses at all.

5 Q MR. JACKSON: Good.

6 A MR. McCAULEY: Okay. Here or anywhere else around
7 Flathead Lake, for that instance? Okay? Is to just elimi-
8 nate it. But given the fact that we think there is a treat-
9 ment system that we know that meets our requirements and is
10 designed properly, it should provide the treatment necessary
11 to prevent any pollution of the lake.

12 MR. PILCHER: If I might respond to that question.
13 The Montana Water Quality Standards classify Flathead Lake as
14 A-1. A-1 probably means nothing to you, so I'll briefly
15 explain what that means. And it says waters that are
16 classified A-1 are suitable for drinking, culinary, and food-
17 processing purposes after conventional treatment for removal
18 of naturally-present impurities. No one is implying that the
19 water from Flathead Lake should be used for domestic purposes
20 without some type of treatment, a simple disinfection or
21 filtration or anything else. The lake is not intended for
22 that particular purpose. Even though we recognize there are a
23 lot of people that are using it as such, we do not condone
24 that use because it's not classified and is not being pro-
25 tected as a source of unfiltered domestic water.

26 Q MR. JACKSON: Well, I'll come back to this. Yes,
27 people have been using it for years. So it's classed as A-1.
28 That doesn't mean nothing to me, that's true. But people

1 have been using it for years to drink and to cook their food
2 in and everything else. So all we have to do is make a class
3 and that's the way it goes? This is what's happened to Lake
4 Tahoe, and it cost millions and billions of dollars to clean
5 it up. Are we going to let Flathead Lake go the same way?
6 Just make a class out of it? A-2? No, I think it's time we
7 started cleaning it up.

8 A MR. PILCHER: These classifications or standards
9 were adopted by the state back in 1965, and at that time,
10 they were established on the beneficial use of that body of
11 water. At that time, it apparently was obvious that the use
12 of that water for untreated domestic purposes was not a
13 recognized beneficial use and as such, the lake is not
14 protected with that in mind. We feel that the water taken
15 from the lake, if it's to be used for domestic purposes,
16 should undergo and we describe conventional treatment for
17 removal of the naturally-present impurities. There are
18 people that use it but they're using it at some risk unless
19 it does undergo the treatment that we prescribe.

20 MR. CROWLEY: We have -- we're at a crossroads,
21 here. I think we need to decide if we're going to
22 have a question and answer period or whether we're
23 going to take testimony, and I don't mean to cut
24 off questions because I know we need to have some
25 exchanges here, but let's take maybe two more
26 questions and then we'll move on to taking testi-
27 mony. Yes, in the back?

28 MR. KEMBEL: My only question would be that I think

1 JON L. HEBERLING, representing Ennis, Erickson, et al, having been
2 first duly sworn upon his oath, testified as follows:

3
4 TESTIMONY BY JON L. HEBERLING

5 MR. HEBERLING: I'm Jon Heberling. I'm a lawyer from
6 Kalispell and I'm here representing the Ennis and Erickson
7 families and other adjoining landowners to the project site.
8 Their main concerns are two. The density of the project and
9 the effect on the lake. Now, as to the density of the
10 project, we would like to see an alternative considered which
11 is less dense, less lots, less land disturbance, than the one
12 proposed. We feel the site would be a good candidate for the
13 proposed Mansfield Center and that would be a good, appropriate
14 use of the land. My clients are not opposed to any
15 development of the site, as the impact statement seems to
16 imply, where it says that -- it refers to people who are
17 fondly looking at the site as an undisturbed remnant of years
18 past. That's not our position at all. We would like a less
19 dense alternative. As to the lake, we are very concerned
20 about the effect of the project on the lake, as many of the
21 people I represent actually do take their drinking water from
22 the lake and they're a lot like I am; I live on Whitefish
23 Lake. I have some kind of treatment system that never got
24 installed right and the water goes straight to the faucet, as
25 does much of yours, I'm sure. So we consider the lake
26 drinking water, and really, to protect the lake, we know the
27 lake is phosphorus-limited, that it's in danger, and the only
28 way to really protect the lake is to protect it as drinking

1 start with the conclusion in the impact statement, which is
2 that this project will not add to the sources degrading the
3 lake. That's a flat statement: "It will not add to it," and
4 they've repeated that here. However, the questions that many
5 of us have asked have raised more further questions than have
6 seen answers. I don't think they really mean that conclu-
7 sion. I think what they're saying is that it will not
8 significantly add to degradation of the lake. We know, of
9 course, there's natural runoff from any piece of property and
10 of course, with spray irrigation, some of those highly
11 erodible soils will go along in the natural runoff process
12 and they'll contain some of the sewage effluent. I think
13 that's inevitable. Also, this is highly permeable soil. The
14 soil tends to drop the water into the groundwater table
15 pretty quickly. And they don't know whether there's a
16 connection between the areas of the sewage irrigation and the
17 lake or not. We can't know that. It's hard to map what's
18 under the ground. But generally, there are -- as to the
19 bedrock, they acknowledge the fractures and that they can
20 communicate polluted waters to the lake. Likewise, clay
21 layers and other types of connections. So I think it's a
22 question of how much gets into the lake, and when you're
23 talking about what's significant or not, you get into ques-
24 tions of ranges. They have to make assumptions. Jim McCauley
25 went through a number of assumptions he made in his phosphorus
26 migration estimates, and when they make these assumptions,
27 the changing the assumption around a little bit gives you a
28 different range of numbers that the computer model will give

1 you; then you have a different range of results. And that's
2 one of my basic problems with the impact statement is it
3 doesn't give you ranges of results. It doesn't give you a
4 worst case, an average case, and a best case. It just gives
5 you an assurance that there's no problem. I'll go through
6 the impact statement section by section. I won't talk about
7 all of them. I'll try to be as brief as possible. Under
8 current conditions, one of the clients complained -- objected
9 to the statement in there that the project is bounded by
10 recreational development at both ends along the lake. Well,
11 at the south end, it's at least a thousand feet before
12 there's any further development, and at the north end, we
13 have what's historically grown up through land use. Not a
14 recreational development in this sense. As to the wildlife
15 section, there's no analysis and no conclusion there.
16 There's only a quote from Jim Cross, a wildlife biologist,
17 who says, "I can't say that osprey would tolerate and accept
18 daily, prolonged disturbances associated with dwellings."
19 Well, this is precisely what they're going to have to be
20 living with, is daily disturbances, and the impact statement
21 only quotes the covenants for the subdivision, which say sort
22 of, "thou shalt not disturb wildlife," and they assume that
23 there's going to be no effect. What the impact statement
24 should do is talk about what's probable. It is probable that
25 there is a wildlife habitat loss here. They should recognize
26 that. The aquatic section of the impact statement is one of
27 the weakest parts, I think. There is some discussion of
28 fisheries, but there's no discussion of the bays. The lake

1 is at risk, but the bays are even more sensitive than the
2 lake is. Where they go to lot densities, they go to five
3 bays, but in this aquatic section, they don't talk about the
4 condition of any of the bays. Now, we know that there have
5 been anabaena blooms in Dayton Bay, which is fairly nearby.
6 The blooms occur when the lake or bay or section of the lake
7 is at a critical point and the decay process begins to
8 accelerate at that point. Well, we know that one of the bays
9 nearby is at that point. We don't really know as to Dewey
10 Bay, what condition it's in. Dr. Jack Stanford is an inter-
11 nationally recognized expert in limnology and the EIS shows
12 no consultation with Dr. Stanford. He has done work in the
13 area of these bays. That should be reflected. Also, the EIS
14 has money available to it, through what's called the fee
15 bill, and I understand they have not used all the money
16 that's available to them for projects like this. Dr. Stan-
17 ford has a leachate detection boat which he can drag. It's a
18 little boat which drags this piece of equipment through the
19 water about four feet off the lakeshore. He's done that with
20 parts of Flathead Lake and is doing that with Whitefish Lake,
21 now. It wouldn't cost too much to inspect the bays. I think
22 the long-time residents can testify to the increasing slipper-
23 iness of the rocks, the change in the water quality, and
24 whether this bay -- whether Dewey Bay or Bennetts Bay is at
25 risk or what kind of risk we're taking with them, that should
26 be looked into. The Fish and Game commented that if there's
27 significant sedimentation, then there'll be damage to the
28 lake trout spawning. Well, there's really no further

1 analysis than that. We don't have a total runoff estimate,
2 and that's something I'll be referring to quite a bit.
3 There's no calculation apparently as to the total area that
4 will be disturbed and a determination of how much runoff will
5 come in the way of sediment to the lake. That the state
6 apparently is deferring to the county's final conditions to
7 its approval, so that hasn't been done yet, and that is one
8 of the key things that's missing in this impact statement.
9 So we need to know how much sediment is going to the shore-
10 line for the fisheries biologist to evaluate what the effect
11 may be on this fishery. There is a model done for the Forest
12 Service. It's a computer model done by Mike Ink and it's
13 used for evaluating road sediments' effect on streams and
14 probably it could be used on lakes as well. I've sent a
15 letter to the Department asking them to use this model in
16 calculating the sediment analysis as to the effect of and
17 disturbance in this area upon the bays which adjoin. Then as
18 to the section on vegetative cover, the EIS repeats the
19 county's comment that up to 20 percent of these lots will be
20 -- that vegetative cover will be removed because there's an
21 area to be barren away from each house, apparently for fire
22 protection, and we're assured that these areas will be
23 seeded, but I think we just found out that there won't be
24 water for irrigation. So there may be some question as to
25 how quickly these seeded areas may return to holding the
26 soil. Of course, as long as they don't hold the soil, you
27 have the soil going off as runoff and erosion down slopes.
28 It's high risk soil. The EIS admits that. And again, we

1 don't have a runoff estimate. So this risk due to loss of
2 vegetative cover, that should be looked at. Now, the geology
3 section is pretty good. It's very detailed in comparison to
4 the aquatic section. One thing that they didn't address was
5 seismic risk. We have earthquakes here; we're in earthquake
6 risk zone two. And that may or may not be important; I don't
7 know. But the earthquake -- the effect of an earthquake on
8 these lagoons concerns me some. They should look at that.
9 The soils section quotes Bruce Bauman's work, which found
10 that the areas of the irrigation zones were high risk for
11 erosion and high risk for permeation down into the ground-
12 water table. The water quality section quotes a report which
13 states that Flathead Lake is rapidly becoming enriched with
14 nutrients, as indicated by the large growths of algae.
15 That's at page ten. However, in actuality, it's worse than
16 that because once you have algae, you're at a point where the
17 decay of the lake is beginning to accelerate. But the EIS
18 doesn't tell us where these algae blooms have occurred, how
19 close they are to this project area, and most importantly, to
20 what extent are these bays at risk for that kind of decay.
21 The EIS talks about controllable phosphorus and lists the
22 usual sources, municipal sewage plants, private sewage
23 plants, and a third source, generally recognized, is subdivi-
24 sion land use due to disturbance of the land. So the ques-
25 tion was already asked in the audience, what's the cumulative
26 effect? What's accumulated from all these subdivisions on
27 Flathead Lake? That's something I'll get to. There's a
28 section on cumulative impacts which really isn't very good at

1 to know about. This is what an impact statement is for. And
2 this is what is not revealed in this particular impact
3 statement. Hopefully, all of these things will be taken care
4 of in the final impact statement. This here is a draft and
5 we're having a hearing on the draft, so hopefully, they will
6 address these problems in the final one. At least, if they
7 don't, the record has shown that we've raised all these
8 problems and Frank knows what that means.

9 REPORTER: Mr. Heberling, excuse me. Can I turn
10 my tape over?

11 MR. HEBERLING: Sure.

12 (BRIEF RECESS - TAPE CHANGE)

13 MR. CROWLEY: We'll go back on the record, now.

14 MR. HEBERLING: Okay, as to the spray irrigation, the
15 design was developed from a computer model and the state is
16 saying that's okay. Whenever you use a computer model, as I
17 mentioned earlier, there are assumptions and the calculations
18 depending on the assumptions develop various ranges of
19 figures. We'd like to see the worst-case analysis based on
20 the assumptions made by the state and then varying those
21 assumptions around reasonably. Our engineer, Jay Billmeyer,
22 has pointed out that the system is designed to automatically
23 spray the effluent, so that means that even if we had three
24 or four days of storms, and the topsoil may be saturated, you
25 can have the system still going on automatically and spraying
26 sewage on top of already-saturated soils which means it may
27 run off. Now, maybe the operator can take care of that.
28 Maybe it won't happen that way. Conversely, you can have a

1 move on. Apparently there's some archaeological site of some
2 importance here. I've been in contact with Evelyn Stevenson,
3 who's counsel for the tribes, and she said she would try to
4 be here. Apparently there is some concern for that. The EIS
5 doesn't tell us what it is or where it is, for obvious
6 reasons; if it's made public, maybe it would be destroyed,
7 which is fair enough. But at any rate, the state archaeolo-
8 gist has recommended that an intensive cultural resources
9 survey be undertaken before construction takes place.
10 However, the EIS does not suggest this as a condition to the
11 permit, and under the ASARCO case, that is within the state's
12 powers and duties. So if this is not done, then this may
13 become an important legal issue under the Indian Religious
14 Freedoms Act or otherwise. The economic section notes that
15 projects like this generally do not pay their own way. They
16 don't contribute as much in taxes as they cost in services.
17 It would be good to have a statement of the ranges in dollar
18 amounts which this may cost the taxpayers of Lake County. As
19 to lot size, there's an analysis of the five-bay area, which
20 includes a lot of the smaller lot sizes. if they consider
21 the project area and the Dewey Bay area, then 100 percent of
22 it is in the last category, which is over three acres average
23 parcel sizes and over 100 foot of lake frontage. I think the
24 lot size question reveals something to me. This is an area
25 where the impact statement, I think, should clearly find that
26 this is inconsistent with historical land uses but they don't
27 do that. I think that may show the bias of the impact
28 statement, that what the state is trying to do is justify a

1 of '84, I've tried to communicate with the water quality
2 department in helping me with some of my fears, only to say,
3 well, everything will be taken care of; wait until later and
4 you won't have any concern about what you're talking about.
5 And so here we are down to this point and I'm even more
6 frightened. But I thank God that the letters came into my
7 possession because as a result of this kind of thing happen-
8 ing, a few of us, five of us, six of us got together and
9 decided we needed some legal help and that's why we had such
10 a nice presentation by Jon up here. First of all, Mark
11 Armstrong couldn't make it. He's a neighbor of ours, down
12 here close to the development, and I says, "Mack, why" --
13 it's Mack Armstrong -- I said, "Do you have any concerns?"
14 And he said, well, yes, I would say a couple of things. One
15 was regarding the bonding system. As he read through it --
16 and I didn't check his figures, but he as he read through it,
17 he didn't see that there was any ponding necessary in terms
18 of the sewage problem that there would be any recourse or any
19 area of recourse, and he thought that was really an important
20 thing to bring up. And the other thing that he wanted to
21 bring up that wasn't mentioned in the impact statement that
22 Jon had mentioned was this narrow area over here where this
23 road will have to go through. He said there's nothing
24 mentioned about the movement, how close that road is; there's
25 no retainer wall, and that's really a problem to the lake,
26 building the road that close, and nothing was addressed to
27 that area. The remarks that have been made have been per-
28 taining mostly to water because we're interested in quality

1 know a lot of them are going to be buying them not really
2 seeing them and not really reading covenants, unfortunately.
3 You know, that's their business; I'm sure they should. But
4 they're going to buy these sites not aware of air quality;
5 they're not aware of what the thing is I'm talking about,
6 this lagoon system. And so we have to be concerned about
7 them as well. They'll be unhappy landowners. I'm also
8 concerned about other developments that are springing up
9 around the lake. The same thing can happen to them that has
10 happened to us in terms of the way developments are put
11 together. So therefore, I'm going to speak my piece. And
12 finally, I feel there has been a disregard for private
13 property ownership in this case, and that's one thing I want
14 to present to the water quality, is my feelings about that.
15 First of all, is Burlington Northern -- have you -- has
16 permission been granted Burlington Northern for this lagoon
17 system? You mentioned in your letter that they were going to
18 get permission.

19 MR. McCAULEY: We have a letter from Burlington
20 Northern, yes.

21 MR. JONES: Okay, and so they have given permis-
22 sion?

23 MR. McCAULEY: Yes.

24 MR. JONES: For the lagoon system?

25 MR. McCAULEY: Yes, it's worded in that I believe the
26 design engineers contacted them regarding the
27 easement or something of a similar nature, and they
28 have written saying they have no objections to the

1 placement of the lagoon the way it's located here
2 in the plans.

3 MR. JONES: Okay. The reason I bring that up is
4 that, according to the law, Burlington Northern and myself
5 are really the only ones who are concerned about this partic-
6 ular problem of air quality control. While I'm mentioning
7 this before him -- can you see, Jim? -- although my home is
8 here, probably one of the places I spend most of my time is
9 this little meadow. The most beautiful, pristine, gorgeous
10 meadow that anybody could ever go into, and in this meadow,
11 there's a beautiful garden with a fence in it. This is
12 surrounded by trees, as you can see. It's very private.
13 It's a low area. Just a short distance from my home. And in
14 this meadow is a well for drinking. Forty-four feet deep.
15 Lovely water. And I have not once heard anybody concerned
16 about that well or the well that's here regarding the spray
17 area. Now, there is a spray area designed for this area
18 right in here. (REFERENCES PHOTOGRAPH) Remember, the lagoon
19 is here; the spray area is here; and the spray area runs
20 right in here. Okay? I have been walking this part of the
21 country for 45 years. I know it well. I know the trails. I
22 know where the deer trails are. I know where the lagoon --
23 where the valleys are. There is a valley -- there is a
24 valley or -- what do you call it -- a gully or valley that
25 comes down right through this lagoon area. In fact, that's
26 the reason they're building it in here, and it comes right
27 down into my garden. This is where they're spraying, right
28 here. And that gully -- it's a gully; it's high here; it's

1 high here. There's another gully that comes down this way
2 and it comes right down over this line and comes down onto
3 the beach. It's a ravine. It's a gully. Air flows down it
4 in the evening. And of course, it flows right across the
5 garden area. Do I need to even mention that the quality of
6 air is important when you go to Flathead Lake? Do I even
7 need to say that? Do I even need to say that when the rain
8 falls on the vegetation, that there's a fragrance that you
9 can't buy anywhere, in the city? Do I need to say that maybe
10 when this spray falls on this vegetation, there might be a
11 fragrance? That it will also precipitate. I know what it's
12 going to be, and the letters point this out. So without
13 belaboring that, may I read from four letters? The first
14 letter is from the engineer, Charles Johnson. The second
15 letter is from the State of Montana Department of Water
16 Quality Control, signed by Jim McCauley. The third letter is
17 again from Charles Johnson, who's the engineer for the
18 project. And the fourth letter is from water quality con-
19 trol. The letters start on November 15 of '83. The last one
20 is on February 7 of '84, when I became concerned. These
21 letters come to me by accident. And again, the Lord must
22 have sent them to me. I don't know where they came from.
23 But they came to me by accident. Most of the stuff that goes
24 on in these developments we don't know anything about unless
25 we have somebody researching it. Okay, from the engineer.
26 "Dear Jim: As a followup to the field inspection and discus-
27 sion of October of 1983 concerning the proposed sewer system
28 for Cedar Island Estates, we are submitting a general

1 criteria which we feel will be appropriate to design the
2 sewage system. Your review and comment concerning the
3 enclosed criteria will be appreciated. We plan to start a
4 design of the system about December of '83, so if you could
5 respond by then, it would be helpful. Further, during the
6 field inspection, you mentioned two items which you felt may
7 require variances. The first dealt with the one-quarter-mile
8 lagoon to building separation as required by paragraphs 102
9 in the Ten State Standards." A quarter of a mile. (REFER-
10 ENCES PHOTOGRAPH) Okay, it is one thousand -- there's 1,325
11 feet in a quarter mile. It's one -- from that lagoon, it's
12 1,000 or 950 feet from my property line. So that's less than
13 a quarter mile we're talking about. From this aerated
14 section here, we're only talking about 200 feet; 190 feet.
15 Okay? And my home of course is right here. So we're talking
16 about a property where there is a concern and the developers
17 know there's a concern. That's why in December, they wanted
18 to hear about the concern because they didn't want to spend
19 all this money and then run into problems with the landown-
20 ers. So they're concerned about this and they wanted a
21 readout from the water quality. Further, during -- okay, "By
22 placing the treatment facility on the hillside as shown on
23 the enclosed drawing, the lagoon storage will meet the
24 quarter-mile separation from existing residences." By
25 building it up there. "However, some residences to be
26 constructed in the subdivision of the Cedar Island Estates
27 will be closer than one-quarter mile. If it is determined
28 that a variance is required for the separation, we would

1 hereby request that it would be given your favorable consid-
2 eration. We feel the variance should be allowed for the
3 following reasons. One, the one-quarter mile separation as
4 stated in the Ten State Standards makes no differentiation
5 between aerated and non-aerated facilities." So they could
6 be considered the one. It's getting rid of sewage. So the
7 aerated could be -- should be considered at the same time as
8 the lagoon is considered but the Ten State doesn't designate
9 that. "But it is probably intended for the non-aerated
10 stabilization ponds and because of the basic biological
11 differences of the two systems, special consideration should
12 be given to the aerated facilities. Since the system is
13 aerated there will be an almost complete absence of objection-
14 able odors from the system." These are developers saying
15 there'll be almost an absence of odor. "Since the lagoons
16 will be set in a forested site, the trees will probably
17 completely screen the system visually and will aid in disper-
18 sing any odors that might be produced. Number four, the
19 lagoons will be at least one-quarter mile from any residence
20 that exists at this time." And it's not. It may be --
21 (REFERENCES PHOTOGRAPH) -- to that residence, it may be
22 approximately just right on a quarter of a mile. But this is
23 my property, and I have a building site. In fact, I have a
24 building site proposed right here. "Number five, prevailing
25 winds in the area range from the northwest to the southwest."
26 Jon brought this up earlier. The prevailing winds -- the
27 developers have done a study, source, the U.S. Weather Service
28 in Missoula, and thereby "air movement across the treatment

1 facility will normally be away from residences located closer
2 to the facility, less than one-fourth mile." So they're
3 saying that the prevailing winds are northwest -- from the
4 northwest to the southwest. Here is northwest. This is the
5 prevailing wind. And from that way to the southwest. This
6 way, they're saying. But the northwest, if you bring that
7 down to the lagoon area, the northwest -- there is the spray
8 area. There's my home and my garden. Exactly where the
9 prevailing winds are predicted to be. "Secondly, you expressed
10 some concern over the slope of the ground in irrigation
11 area" -- and I'm not going to cover this one paragraph that
12 deals with a concern that the water quality board had about
13 the slope. But I'm not dealing with that particular issue
14 now. Okay, state response. "In response to the design
15 report" -- and this was January 9 -- "submitted to our review
16 of the above-reference subdivision, I have comments regarding
17 three specific items. First, a deviation request was made to
18 the review committee for less than one-fourth mile separation
19 between the sewage lagoon cells and the habitation. It was
20 understood that there are no homes existing within a quarter
21 of a mile of the proposed sewage treatment system. However,
22 the homes within the subdivision and undeveloped land
23 adjacent to the lagoon site are within the one-fourth mile
24 distance. Therefore, the committee feels that a deviation
25 cannot be considered further until an easement or a similar
26 agreement is reached with the adjacent landowners acknowledging
27 the placement of the lagoons and the one-fourth
28 mile separation provisions." I was happy to get this letter.

1 "Potential buyers should be made aware of the lagoon through
2 the Cedar Estate Covenants." And, "Final design will be
3 needed to show that the aerated facility will not pose an
4 odor nuisance." This is the air quality control people --
5 or, the water quality control, saying that they will need to
6 show that the aerated facility will not pose an odor. "Next,
7 it was apparent from your design calculations for sewage
8 flow" -- and then it goes into the slope part of it, and the
9 rest of that letter deals with the slope, which I'm not going
10 to cover. And Charles Johnson responds January 18, which is
11 ten days later. "Dear Mr. McCauley: In response to our
12 telephone" -- telephone conversation; I thought I had it all.
13 I had the written conversation -- but "In response to our
14 telephone conversation and your letter of January 9, we would
15 like to provide you with further information on proposed
16 Cedar Island Estate sewage treatment facility. At issue is
17 the one-fourth mile distance requirement from places of
18 habitation. First of all, the system can be designed and we
19 have successfully designed similar systems which are es-
20 sentially odor free. The only odor is a soapy smell, often
21 associated with activated sludge plants or the aeration
22 process. In any event, we will forewarn any potential lot
23 owners of the type of sewage treatment proposed and what may
24 be expected in the homeowners' association covenants." But I
25 don't know if they were going to tell me about it, but they
26 were going to let the landowners know. And Jim didn't
27 describe it as soapy. He said it was kind of a damp smell.
28 So you know, that's -- but, boy, there's a nice smell there

1 that I don't want to lose. "With respect to the adjacent
2 landowners, we have provided a Forest Service ownership map,
3 the U.S. Geological Survey Quadrangle Map, a site
4 specific topographic map and an aerial photograph of the
5 subdivision area. As you can see from the information, the
6 sewage treatment area is bordered on two sides by Burlington
7 Northern property. We can present our case to Burlington
8 Northern officials and have a reasonable chance of obtaining
9 their permission to construct the proposed sewage treatment
10 system. Our major problem, however, would be in obtaining
11 permission from properties slightly within the one-fourth
12 mile limit of the aerated lagoon" -- slightly within the
13 one-fourth mile of the aerated lagoon; that's 200 feet --
14 "directly to the south of the system." (REFERENCES PHOTO-
15 GRAPH) That's us. "Our major problem, however, would be
16 obtaining permission from properties" -- okay. "Although we
17 have not approached these people, we know that they were
18 against the subdivision and would see no advantage in helping
19 us by agreeing to the sewage treatment facility. We there-
20 fore need clarification as to the intent of the one-fourth
21 mile limitation and if necessary a variance from its appli-
22 cation. To put this problem in perspective, the following
23 facts are important. One, the aerated lagoon cell is located
24 over one-fourth mile from any existing or potential habitated
25 area except the Burlington Northern land." Is that the
26 information that's true? No. "The holding cell is located
27 over a fourth of a mile from any existing buildings, but a
28 potential building site area outside of the subdivision

1 is within one-fourth of a mile." So they did admit that.
2 "We interrupt" -- or, "We interpret your regulations to mean
3 that a one-fourth mile should be maintained from any ponds
4 needed to achieve secondary treatment. With this in mind,
5 the only permission we perceive to be needed is from Burlington
6 Northern. From a technical standpoint, we would further
7 advance this thinking with the following information. One,
8 if there is a concern with odor from the ponds, it should be
9 noted that concern should only be directed towards the
10 aerated cell where odors, however remotely, could develop.
11 The holding pond for treated effluent will have some aeration
12 to keep it stable and odor free and should not be of concern."
13 So here the developers are saying, yes, there might
14 be a problem 200 feet from somebody's property, and this
15 information was given to the water quality board and the
16 developers were concerned about it. "Number two, please
17 review the topography and aerial photo and note that the
18 property to the south is screened by heavy timber and a major
19 ridge. Natural air currents" -- not prevailing -- but
20 "natural air currents will be down the draw to the southwest
21 or when predominantly westerly winds occur, be to the east."
22 The developers are telling the water control people that the
23 natural air currents are over this way. They're asking;
24 they're saying please consider this before you give us any
25 permission because we're concerned about it. "Please advise
26 if you concur in this analysis. Once you do, we will proceed
27 to talk with Burlington Northern and if possible obtain
28 concurrence in building the treatment system. We believe the

1 proposed system is the best system from both an operation and
2 treatment standpoint. We would hope that this fact would be
3 considered in your analysis. The other design criteria as
4 spelled out in your January 9 letter is acceptable to us.
5 Please return the photo, but you may keep other documents
6 enclosed." And finally, on February 7 -- and as a result, we
7 decided we needed to get legal help -- from Jim to Charles
8 Johnson. From Jim McCauley. "Per our recent phone con-
9 versation" -- again, another phone conversation -- "I have
10 discussed the location and design of the lagoon system to
11 serve Cedar Island Estates Subdivision with other members of
12 the Deviation Committee. It is our decision that we will not
13 require a one-fourth mile separation to property located
14 immediately south of Cedar Island for the following reasons."
15 Hadn't even talked to us. The Water Quality people that
16 protected private property. "Number one" -- these are the
17 reasons that the state gave. "Number one, if the lagoon site
18 is influenced by predominant westerly winds, land owned by
19 Burlington Northern to the east would be most effected.
20 Localized air currents would travel down the draw where the
21 lagoons are situated in a southwesterly direction toward
22 Flathead Lake." So they're admitting that wind will drift
23 down in this, but they still decided not to ask for a waiver
24 from us. "Number two, local topography and timber screening
25 of the proposed lagoon site" -- "screens the proposed lagoon
26 site from the land to the south." Talking about lagoon site.
27 "The proposed lagoon site is approximately 1,000 feet" --
28 it's 950 feet -- "from the Cedar Island Estates southern

1 boundary line. A difference of 320 feet from the one-fourth
2 mile separation should not be a significant factor in this
3 particular case." In other words, they're not even talking
4 about this. In part of the letter, they're talking about the
5 spraying system, but then they go back to their law and they
6 go back and they're saying, well, being it's less than a
7 quarter mile, we're not going to deal with that. A differ-
8 ence of 300 feet shouldn't make any difference. "It should
9 be noted that it is our" -- and "our" is underlined -- "it is
10 our responsibility to interpret regulations regarding minimum
11 separation distances. We do not distinguish between the type
12 of treatment provided when applying the one-fourth mile
13 minimum. However, design is concerned when a deviation is
14 reviewed. We will require" -- they underline "will" --
15 "require that an easement or a similar agreement be obtained
16 from Burlington Northern for those lands to the north and
17 east of the lagoon site." I'm trying to present something
18 that I've not been able to talk to anybody about since
19 February of '84 and I'm really happy for the chance to
20 present this to the water quality control board. Please keep
21 in mind where my well is. Forty-feet deep. And I appreciate
22 any response you would have now, in public, to these letters.

23 MR. McCAULEY: I can address some of those things. I
24 guess -- let's see, you did write a letter to me at
25 one point, right? And I responded, I believe.

26 MR. JONES: You said it was going to be okay.

1 get here in the mail today and I picked it up today. Made it
2 awful difficult to copy it to Counsel. "Dear Mr. Sorensen:
3 At your request, I have read the Shelter Bay Estates EIS. I
4 believe the Water Quality Bureau has done a reasonably
5 thorough job of preparation of this document. I agree with
6 the conclusion that the sewage system will adequately serve
7 the development while minimizing the chance of polluting
8 Flathead Lake. This is the third new land disposal system
9 planned or under construction around the lake. Although all
10 three of these systems seem to be effectively designed,
11 proper O and M will be essential and I hope the Water Quality
12 Bureau will maintain proper surveillance. Since we can
13 expect more developments of this sort around the lake, I
14 think it may be important in the near future to consider the
15 cumulative and long-term effects of high-density housing
16 projects on all aspects of lake and groundwater quality. One
17 part of the EIS did seem rather briefly considered, the
18 potential erosion from steeply-graded roadways and construc-
19 tion berms. I think this could be a problem, especially is
20 heavy precipitation should eventuate before growth cuts are
21 stabilized. Furthermore, the stated drainage plan does not
22 insure that eroded soil will not be carried into the lake
23 during or after construction. As you know, research at the
24 Biological Station has demonstrated that soil erosion will
25 fertilize the lake water and contribute to the chronic algae
26 problem. I do not mean to overstate a potentially small and
27 localized problem, but the terrain at the Shelter Bay site is
28 very steep and I think more attention to proper drainage of

1 surface water is needed. Otherwise, I generally agree with
2 the EIS and am pleased that the protection of water quality
3 at Flathead Lake assumed high priority amongst all concerned
4 about the Shelter Bay project. Sincerely, Dr. Jack Stanford,
5 Director of the Biological Station." I don't have a signed
6 letter because I had to get a copy today, but I will submit a
7 signed letter.

8 MR. CROWLEY: Thank you, Mr. Sorensen. The floor is
9 open. Please, just take your spot at the map or at
10 the microphone.
11

12 HELEN JONES, representing Friends of Dewey Bay, having been first
13 duly sworn upon her oath, testified as follows:
14

15 TESTIMONY BY HELEN JONES

16 MS. JONES: I'm Helen Jones. I just have a couple
17 of things to say, that we have felt from the beginning that
18 no matter how finely-tuned and developed this project is,
19 it's in a way like saying if the welfare agency found some
20 children locked in a home for three days or left in a home
21 for three or four days at a time, and the people come back
22 and say, "But it's a beautiful home; we have the finest of
23 locks on it. It's got beautiful landscaping around it." The
24 fact is that the whole project is put in a beautiful recluse
25 area that has been that way for years and it's ruining that
26 whole idea of being away from masses of people, from being
27 away from town-type development, and as beautiful as it may
28 be and turn out and all the care to do it right, the whole

1 week, or whenever he feels like it, or just what. I think
2 this is very loose and very ill-defined to begin with. I
3 don't think there's any assurance ten years down the road
4 that either of these systems will be properly manned, without
5 a problem existing first that would eventually result in
6 legal action to correct it. The other area is fire protec-
7 tion. Back in '83, they made reference to a water supply of
8 500 gallons per minute. Now we're talking about a well with
9 20 gallons per minute. We're told there are tanks but
10 they're only suitable for filling a tanker. Tankers come in
11 all different sizes and shapes. Pumpers come in all differ-
12 ent sizes and shapes. I don't think it's very well defined.
13 But the overall picture I get is there just isn't a whole lot
14 done in the subdivision for fire protection. I think that if
15 we're adding this many homes in an area and I think, by
16 relatively conservative judgement, you're adding approximate-
17 ly 20 percent or more to the value of property to be protect-
18 ed in our fire district. I think there's very little being
19 done by the developer to assist the Fire Department in being
20 able to do a better job in protecting these homes, and I
21 think the people that are buying these lots have a very
22 definite vested interest in how the fire protection is made
23 available. I think that the developer should take more steps
24 to work with the Fire Department. It's a donation-supported
25 department. I think there should be more steps taken to
26 insure that the Fire Department can do a better job should
27 the need arise. I don't like to think that we'd have to burn
28 down a couple of \$100,000 houses before some action is taken.

1 MR. CROWLEY: Would you like to respond, Mr. Melstad?
2 MR. KEMLER: I just wanted to point that out.
3 MR. CROWLEY: Okay.
4 MR. KEMLER: Thank you very much.
5 MR. CROWLEY: Thank you, Sir. Yes, Sir?
6

7 FELIX F. MORAN, representing himself, having been first duly sworn
8 upon his oath, testified as follows:
9

10 TESTIMONY BY FELIX F. MORAN

11 MR. MORAN: I'm Felix Moran, and it seems like
12 everything has been addressed here that I can even think of,
13 and many of them I couldn't. (APPROACHES EASEL) But I don't
14 think this road -- this connecting road has been adequately
15 addressed at all. When this was first proposed, it was
16 proposed primarily as an emergency road and I assume that's
17 what it's still proposed to be. And I live right directly
18 across the bay. If this road is cut in here, you can imagine
19 what site damage it's going to do to this thing here. Just
20 for the record, I have opposed this whole development all
21 along because I'm selfish; I like the natural area. But if
22 it's going to be put in there, and this -- I don't believe
23 that this emergency road, the price of it and the loss of
24 this area here could even justify what little need it would
25 ever be if it's used only for emergency purposes. That was
26 the original approval by the commissioners. This type of
27 development -- I don't mean this type of development but this
28 development, you'll find it all over the country, it ends in

1 were the original densities that perhaps were proposed at one
2 time, but after several public hearings, the density was
3 considerably reduced and that's what the figures are now.
4 Also, I wanted to make one comment for the record regarding
5 the cooperation. Mr. Heberling said that their engineer had
6 trouble evaluating some of the data. I would like to make it
7 clear that we personally did contact their engineer, Jay
8 Billmayer, and offered to cooperate in any way, with any
9 information of any nature that would help him in the evalua-
10 tion of our data, and we have had no contact. I would also
11 like to clarify one point which was brought out in the EIS
12 adequately, I think, but which seems to be of quite a concern
13 to many of the people, and that's that the application rate
14 for the proposed sewage treatment area is actually about one
15 forty-fourth the application rate that you all have if you
16 have a modernly-designed drainfield. So therefore, you can
17 get some feel for the type of nutrient reduction that this
18 effluent applied to the surface of the ground as compared to
19 the effluent that is provided through a drainfield under a
20 subsurface disposal method. Also, there was concern for the
21 cut, here, and I can certainly understand your concern for
22 that cut, because when we initially were going to locate this
23 road, I had the same concern and would not like to see this
24 road cut across. Mike Hutchin, the County Commissioner at
25 that time -- well, I guess he still is -- and Jerry -- are you
26 involved, I believe -- but Mike had looked at this location
27 for a connecting road and he pointed it out to us and subse-
28 quently we surveyed and designed this connecting road, and

APPENDIX C

5 June 1985

Water Quality Bureau
Subdivision Section
Montana Department of Health
and Environmental Sciences
Cogswell Building
Capitol Station
Helena, Montana 59601

Gentlemen:

Re: Shelter Bay Estates
Draft Environmental Impact Statement

I have several comments on your draft environmental impact statement.

- ✓ 1. The described development is at least one half of the shore of Dewey Bay and yet there is no description of the aquatic environment of that bay with the exception of a short excerpt from a letter regarding fisheries. There are many other aspects of the bay which might be influenced by the project, such as its present water quality and temperature, its circulation, the likely deposition pattern of effluents or sediments (which will change depending on whether discharged in high or low water), plant life, etc. In fact there is no discussion whatsoever about the unique characteristics of this small, peaceful bay and the micro-environment it contains, an environment which is critically different from the larger lake. This failure to examine the project's impact on Dewey Bay as opposed to the lake as a whole pervades the statement and leads to serious errors and oversights in the statement.
- ✓ 2. The sewage system is highly engineered and will not be effective unless properly operated and maintained. Without a description of the mechanics of ownership and control, a reader of the statement has no way of knowing whether this will be properly done. See p. 11.
- ✓ 3. Please explain what is meant by "odor will be minimized" on p. 11. Will we be able to smell it at our home which is directly across Dewey Bay from the development?
- ✓ 4. At the top of p. 13, what are your conservative estimates? The department does not expect a "nutrient impact." Will additional nutrients enter the lake? Will there be an impact on Dewey Bay, as opposed to on the lake as a whole?

5. M. K. Botz's letter and the discussion on pp. 14-17 about the risk of contaminating the well - there is no discussion of the risk of contaminating the bay or the lake. Remember, most of us on the bay take our domestic water from the bay and have long-established water rights. We have the right not to have the water contaminated or degraded.

6. The statement contains no substantive description of or conclusion regarding run-off into the lake from construction and use of the forty-three homes, out buildings, driveways, yards, boathouses which the project envisions. The lots will be expensive and most of the homes will be large. According to p. 33 of the statement, many of the lots will have long, steep driveways. Common sense indicates that there will be much erosion during the construction period - which could string out over many years. There will also be increased erosion because of the large percentage of the land which will be covered by houses, patios, garages etc and will not be available to absorb the water. You must examine and explain how these additional sediments and nutrients and contaminants will affect our bay. Surely they will not be beneficial.

The Environmental Impact Statement does not adequately consider the cumulative effects of this and other subdivisions on either the bay or the lake.

The problem in the bay is particularly acute because approval of this project may result in attempts to locate several similar projects on the bay with similar impact on its water quality.

Sincerely,

Carolyn K. Ennis

Carolyn K. Ennis
3000 Walden Place
Billings, Montana 59102
and
Rollins, Montana 59931

RECEIVED

JUN 14 1985

LEGAL DIVISION

APPENDIX D

BILLMAYER ENGINEERING

2191 Third Avenue East ■ Kalispell, Montana 59901 ■ (406) 257-8708

June 12, 1985

TO: Jon Heberling
FROM: J. Jay Billmayer
SUBJECT: Shelter Bay Estates, Engineering Review

1. A copy of the water balance for the sewage effluent holding pond is attached. Review of the water balance prepared in May of 1985 by SDA indicates there will be approximately 21,000 gallons of excess effluent at the end of the application season. To alleviate this accumulation of excessive effluent the pond operator needs to apply additional effluent to the spray irrigation site in that amount. The effluent holding pond not only is subject to the design flows resulting from the development of the lots but also precipitation into the pond and evaporation from the pond surfaces. This analysis recognizes 24 inches of precipitation (1980 annual rainfall) and includes 35 inches of evaporative losses. In the revised engineering design report dated March 1985, SDA sites the SCS technical bulletin # 7 as a source for this evaporation loss. NOAA maintains an evaporation pan at Hungry Horse Reservoir. The annual evaporation losses are 29.72 inches all occurring during the months of May through September. This reduced evaporation results in an additional 5 inches of water within the pond system that must be discharged. In the event it is not discharged, pond operation will result in excess inflow of approximately 93,000 gallons per year. This could exceed the reserve capacity of the pond system within one year. A water balance reflecting the reduced evaporative losses is attached.
2. Run off prevention ditches and rock drainage located below the spray irrigation areas appear to be inadequate. Although the intent is to collect and route to subsurface disposal any surface runoff resulting from excessive application of treated effluent, there is no sizing rationale or details presented for the rock drainage sump. A storm occurring during the evening hours just after application in a spray irrigation area could yield significant runoff flows that have not been addressed. This precipitation could flow across the spray irrigation area, be collected in the runoff prevention ditch for routing to and inundation of the rock

drainage sump. This would result in concentrated overland flows that could potentially affect lots 4, 7, & 8 as well as Flathead Lake. There is no rationale presented on how the rock sumps will store and disseminate accumulated surface flows into the ground water system. There is no discussion regarding the impact of the saturated flows in the ground water system and their ultimate migration toward the lake. For your reference see cover sheet on Water & Sewer System Improvements as well as Sheet 7 of 10.

3. Storm drainage impacts are not adequately addressed in the plans. The draft EIS on page 18 last paragraph indicates the engineer's design employs overland flow from out sloped roadways to control sediment and debris transportation in a majority of the area. This method of construction does not address the increased runoff potential due to cut slopes, increase of runoff volume resulting from a change of ground cover characteristics, or site grading changes resulting from housing and driveway construction. The drainage report does not adequately address the containment volume and absorption of storm water at the subsurface sump associated with the road cut and the boat ramp area.

A storm drainage analysis was performed for the Shelter Bay Estates area and surrounding drainage basin. The rational method was employed as the basis for this analysis. The Shelter Bay Estates area was divided into 2 drainage sub-basins. The first basin indicated as # 1 on the attached drainage map contains 51.2 acres off-site and 19.5 acres within the development boundaries for a total 70.70 acres. The second sub-basin serves 9.1 acres outside the subdivision boundaries and 46.2 acres within the boundaries for a total contributing area of 55.3 acres. In short, the area contributing storm water runoff to the natural drainage system within the Shelter Bay property is approximately 126 acres.

Development of the Shelter Bay Estates property will result in a change in land cover and there by intensify the storm water runoff flows. This change is reflected by a modification of the runoff coefficients utilized in the storm drainage analysis. Runoff coefficient for undeveloped wood and forested land areas is 0.15 while the coefficient for developed residential property with approximately 1 dwelling

unit per gross acre of land area increases to 0.30. It should be further recognized that the areas associated with the land application/spray irrigation system also will receive a modification of the runoff coefficient. This modification stems from the fact that there is a very high probability the ground surface will be saturated when a storm event occurs. For this analysis, the spray irrigation area runoff coefficient was also increased to 0.30.

The drainage system was then analyzed for a storm with a 10 year reoccurrence interval (10% probability of occurrence) for the Kalispell area. The Kalispell rainfall intensity curves were utilized as representative for the subdivision area due to lack of more precise data. The rainfall intensity was adjusted for the varying time of concentration for each sub-basin. The results of this analysis are reflected in the following table:

SHELTER BAY ESTATES
AND
SURROUNDING DRAINAGE AREA
Computed Runoff Volume

| | <u>BEFORE</u> | <u>AFTER</u> | <u>INCREASE</u> |
|-------------|---------------|--------------|-----------------|
| Basin #1 | 10.6 CFS | 13.5 CFS | 2.9 CFS |
| Basin #2 | 13.5 CFS | 24.4 CFS | 10.9 CFS |
| Both Basins | 24.1 CFS | 37.9 CFS | 13.8 CFS |

From the above table it can be seen the storm water flows will increase by 2.9 CFS for the drainage sub-basin #1 and 10.9 CFS for drainage sub-basin #2. The additional storm water runoff could pose a development restriction to the lots located in the drainage ways.

For drainage sub-basin #1 these flows will affect lots 16, 17 & 18 as well as lot 2. The site plan for water and sewer improvements indicates the areas most suited for building sites are those areas lying directly in the natural drainage system.

Also well site #1 as well as lots 4, 7, 8 and 13 through 17 all have areas shown as most suitable for building sites located within the drainage system. Further, the airted cell and the holding cell for the sewage disposal system are sited directly in the storm water drainage course. Protective ditching must be constructed to route this storm water flow around these sewage disposal facilities as well as away from the ultimately constructed dwelling units.

This increase and intensified flow will result in transport of eroded sediments toward and into Flathead Lake. Mr. Bruce J. Bauman in his report dated February 6, 1985 presents soils classification information for the Shelter Bay Estates area. Two major soil classes are identified. They are Repp and Kingspoint series. Excerpts contained in Mr. Bauman's report from the Lake County area soil survey (June 1983) indicate both soil systems and topography will yield rapid runoff and high hazard of water erosion. Should these soil systems be disturbed there is high hazard of soil erosion. With both soil systems the erosion potential exists and should be addressed in the ultimate design of a storm drainage system for this development.

4. Water is supplied to properties within the subdivision via gravity flow. Sewage effluent is removed from the subdivision via pumps at the septic tank discharge that must be energized. In the event of power outage continued water used by homeowner's will result in inundation of the septic tank and effluent pumping chamber which will ultimately result in sewage over flow onto the surface. The potential and impact of this occurrence has not been addressed. It is interesting to note that should such an event occur there is no surface runoff collection or treatment system to control these sewage flows or prevent their migration into Flathead Lake.



University of Montana

Biological Station • East Shore, Bigfork, Montana 59911 • (406) 982-3301

May 29, 1985

APPENDIX E

Mr. Jerry Sorensen
Land Services Department
Lake County
Polson, Montana 59868

Dear Mr. Sorensen:

At your request, I have read the Shelter Bay Estates EIS. I believe the Water Quality Bureau (WQB) has done a reasonably thorough job in preparation of this document. I agree with the conclusion that the sewage system will adequately serve the development, while minimizing the chance of polluting Flathead Lake.

This is the third new land disposal system planned or under construction around the lake. Although all three of these small systems seem to be effectively designed, proper O & M will be essential and I hope the WQB will maintain proper surveillance. Since we can expect more developments of this sort around Flathead Lake, I think it may be important in the near future to consider the cumulative and long term effects of high density housing projects on all aspects of lake and ground water quality.

One part of the EIS did seem rather briefly considered: the potential erosion from steeply-graded roadways and construction berms. I think this could be a problem, especially if heavy precipitation should eventuate before road cuts are stabilized. Furthermore, the stated drainage plan does not insure that eroded soils will not be carried into the lake during or after construction. As you know, research at the Biological Station has demonstrated that soil erosion will fertilize the lake water and contribute to the chronic algae problem. I do not mean to overstate a potentially small and localized problem; but, the terrain at the Shelter Bay site is very steep and I think more attention to proper drainage of surface water is needed.

Otherwise, I generally agree with the EIS and am pleased that protection of water quality in Flathead Lake assumed high priority amongst all concerned about the Shelter Bay project.

Sincerely,

Dr. Jack A. Stanford
Director

JAS/rsp
cc: Mr. Steve Pilcher, Water Quality Bureau
Dr. Howard Reinhardt, Dean, College of Arts & Sciences



APPENDIX F

CULTURAL RESOURCES INVENTORY

SHELTER BAY ESTATES, LAKE COUNTY, MONTANA

Introduction. On June 14, 1985 two archaeologists, faculty in the Department of Anthropology, University of Montana, conducted a pedestrian survey for cultural resources in the E $\frac{1}{2}$, SW $\frac{1}{4}$ and the SW $\frac{1}{4}$, SE $\frac{1}{4}$ of Section 21, T25N, R20W. This area will be developed into a residential community, Shelter Bay Estates. Development will require new roadways, power, water and sewer lines and disposal areas as well as the building of residential units and waterfront facilities.

We acknowledge with thanks the help given to us by Mr. Charles Johnson of Stensatter, Druyvestein and Associates, Consulting Engineers who furnished us with detailed maps and verbal directions.

Objectives. (1) To conduct a systematic visual inspection of the exposed surfaces within the area to make sure that no archaeological, historical, or paleontological resources will be endangered by any of the activities that are associated with the area development.

(2) If cultural resources were found, to provide evaluations, interpretive statements, and make recommendations for mitigation.

Research Design. We conducted an archival and literature search in order to become familiar with those known reported cultural materials present within the general area of Rollins and the proposed development. Information thus gained would allow us to formulate hypotheses as to the varieties of cultural resources that we might expect to find in our survey.

While conducting the archaeological survey we proposed to inspect ground surfaces, rodent burrows, roadways, and cutbank exposures for archaeological features, artifacts, lithic debris, charcoal or fired rock, or any other evi-

dences that suggested human activities associated with the present surface or in buried levels. We would carefully examine the lake shoreline and the exposed surfaces of rock outcroppings. If cultural materials were found they would be analyzed and interpreted in terms of the following problems:

1. Chronological placement in time on the basis of artifact types or features of known age, by lithic hydration, radiocarbon, or other chronometric techniques. When the age was known the site area could then be placed into the general cultural sequence that has been developed for western Montana.

2. Ecological adaptations. We would attempt to determine, from the analyses of cultural and other remains, the people's adjustments to the area's particular environment and their patterns of exploitation of plant, animal and other resources.

3. Activity areas. From analyses of distributions of specific types of materials (artifacts, lithic debitage, bone, ash, rock, seeds, etc.) we should be able to define areas where particular behaviors took place and to establish intrasite and intersite relationships.

4. To relate the data about behaviors and cultural processes to regional syntheses and to cultural theory in general. If any paleontological remains were found we would immediately consult a professional paleontologist for his evaluations and recommendations.

Area Description and Methodology. Our search of the Statewide Archaeological files at the University of Montana revealed the fact that a fair number of sites are recorded around the west shore of Flathead Lake. Occupation sites and human burials were found between Elmo and Dayton. Numerous fire hearths, exposed when the lake level is low, and a burial were reported from the vicinity of Sommers.

Closer to Shelter Bay Estates, the following archaeological and historic sites are known to be present within the township (T25N, R20W):

- 24LA12 . . . an aboriginal burial located "north of Rollins on lakeshore property." A more precise location was not given.
- 24LA98 . . . NW $\frac{1}{4}$ NW $\frac{1}{4}$, Section 9. Historic logging chutes.
- 24LA95 . . . SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 20. Historic cabins.
- 24LA96 . . . NW $\frac{1}{4}$ SW $\frac{1}{4}$, Section 20. Historic Post Office and store.
- 24LA94 . . . NE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 30. Historic cabins.
- 24LA1051 . . . N $\frac{1}{2}$ SW $\frac{1}{4}$, Section 20. Occupation; hearth on lakeshore of Canal Bay.
- 24LA1026 . . . SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 22. Pictograph panel. "Painted Rocks."
- 24LA1052 . . . SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 22. Pictograph panel; another segment of "Painted Rocks."

The area of Shelter Bay Estates lies along the west and southwesterly side of a peninsula which extends into Flathead Lake about a mile north and east of Rollins, Montana (c.f., Map 1). The peninsula is a rocky ridge of weathering argillite. Within the project area the terrain slopes 20 to 30 degrees downward, mostly in a westerly direction, to the lakeshore. The slope is broken by many vertical-faced outcrops of rock 5 to 20 feet high, narrow discontinuous terraces, and small steeply-inclined drainage valleys. Except for roadways and a small once-cleared area, the region is forested. Trees are ponderosa, lodgepole pine and fir. Ground cover consists of several grasses, lupines, arrowroot, huckleberry bushes, ground cedar, currant bushes

and other plants. Roadways, except for tire tracks, are covered with dense grasses and bushes. A roadway divides the development area into two parts -- one (Block 2) extending upslope towards the north and east; the other (Block 1) extends downslope towards the south and west. North of the roadway ground cover was thick; duff and plants obscured the ground, so that only about 25% of the surface was visible. South and west of the road, in Block 1, the woods had been thinned, there has been more preliminary surveying and other activities. Here approximately 60% of the ground surface was exposed. Many test holes, each more than 5-feet square, have been excavated throughout the entire development; these gave us frequent opportunity to examine subsurface levels.

In doing our visual inspection the two men, spaced approximately 100 feet apart (sometimes a little farther apart, rarely closer) walked following around contour levels. We frequently deviated from our paths to examine rock outcrops, look at disturbed areas, or investigate the most likely looking spots. Our survey transects are shown by the red dashed lines on Map 1. We carefully scrutinized exposed faces on the rock ledges for pictographs. The exposures, all facing west or southwest, were badly weathered, and we saw no evidences of pictographs. At the bases of the argillite scarps, especially close to the lakeshore, there are rocky talus slopes or jumbles of rock blocks.

Roadways, facility lines, and lot boundaries were sometimes marked with survey stakes. Ground signs and the detailed maps made it possible for us to orient the survey at all times.


We did not survey or trespass into the large lakeshore plot between lots 14 and 15. It was clearly posted "No Trespassing", and Mr. Johnson had advised us to keep out.

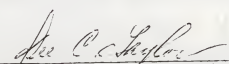
Archaeological Survey Results. Our survey crew did not encounter any cultural resources that might be threatened by activities in the development of Shelter

Bay Estates. A relatively open area, grassy with a few young trees, includes parts of Lots 3, 4, 17, 16, 15, 14 and 13 in Block 1. This area appears to have been clear-cut many years ago. There is a live mature apple tree in the southeast corner of Lot 4. A roughly rectangular-shaped depression lies 80 to 90 feet south of Well No. 1, and in the western quarter of Lot 3 there is part of a disintegrating log foundation. Rusting machinery lies near the lake shore between Lots 3 and 4. We did not see anything which we considered to be archaeologically or historically significant, and we do not believe that these are present.

Archaeological Recommendations. No mitigation or further testing appears to be necessary. Although we consider it fairly unlikely, it is possible that future excavations, building, or levelling activities might reveal the presence of buried cultural materials. Most of the rock escarpment seem to be located away from the most desirable building spots. However, if the rock ledges are disturbed particular attention should be paid to the rock debris below the cliffs and to the talus slopes (such as, for example, the steep talus near the shore in Lot 2, Block 1). Elsewhere around Flathead Lake some of the pre-historic and early historic peoples buried their dead in such locales. If during construction any such subsurface cultural materials should be encountered we request that an archaeologist be notified immediately so that proper evaluations, recommendations and procedures could be done.

Field archaeologists.


Thomas A. Foor, Asst. Professor, Anthropology


Dee C. Taylor, Professor, Anthropology



STATEWIDE ARCHAEOLOGICAL SURVEY
UNIVERSITY OF MONTANA

1. County LAKE 2. Map _____ 3. Site No. 24LA 59

4. Twp. 25N Range 20W ; SW $\frac{1}{4}$ of se $\frac{1}{4}$ of Sec. 21 5. Contour Elevation 2900

6. Location and Access Take highway 93 north out of Rollins. Turn toward lake at Shelter Bay Estates turnoff. Continue on dirt road to Shelter Bay Estates development. Site is found near lakeside on lot 3 of Block 1 at head of Bennett's Bay.

7. Type of Site Historic log structure of indeterminate use.

8. Description of Site A relatively open area, grassy with a few young trees, includes parts of Lots 3, 4, 13, 14, 15, 16, and 17 in Block 1 of the Shelter Bay Estates development. This area appears to have been clear-cut many years ago. There is a live mature apple tree in the southeast corner of Lot 4. A roughly rectangular depression approximately 10 x 14' in size lies 80 to 90 feet south of Well No. 1, and in the western quarter of lot 3 there is part of a disintegrated square-cut log foundation. Rusting machinery lies near the lake shore between Lots 3 and 4. A records search by the consulting engineers for this development disclosed that the land has been in commercial ownership since the original land grant resulted in possession by Glacier Park Company. Our best guess is that this site is either related to the historic timbering activities in this area or it is the remains of a "squatter's" settlement.

9. Previous Designations None 10. Published References None

11. Owner Jack Green Jr. 12. Address Missoula 13. Present Tenant _____

14. Site Area 5000 ft² 15. Est. Depth Surface

16. Vegetation Cleared western conifer forest--young trees, grasses, shrubs.

17. Nearest Water Flathead lake--10 yards

18. Possibility of Destruction It is already destroyed.

19. Recommendations No further action.

20. Artifacts Collected None

21. Artifacts Observed Pieces of rusted machinery.

22. Foto Numbers None

23. Recorded By T. A. Foor/ D. C. Taylor 24. Date June 14, 1985



APPENDIX G

Interest
Islands
e 4

9. Electricity and Telephone.

Electricity will be provided by Pacific Power and Light and telephone service by Northwestern. The developers have submitted their proposal to both companies and at present neither has responded. As such, it is unknown if these facilities are readily available in the area.

B. Installation of Public Improvements.

If the project is approved, the developers will be responsible for installing all of the improvements which include the sewage system, water system, roads, common driveways, electric utilities, telephone utilities, fire facilities, and drainage facilities.

If final plat approval is granted prior to these being installed, the developers will need to bond for 100% of the cost of installing these improvements. The usual time period allowed for installing the improvements is two years after final approval. During the last few years some developers have had difficulty selling lots in subdivisions and therefore are reluctant to go to the expense of installing the improvements. When this occurs it places a burden on the county to insure that improvements are installed in a timely fashion and that bonding is kept current. If improvements are not installed in a timely manner, the county may be liable for getting them installed.

This is a large scale project and the improvements will be very costly. The county will need assurance that the developers are capable of carrying through with the improvements, even if lots do not sell as anticipated.

C. Conclusion of Impact to Local Services.

The developers state the following:

"Because the subdivision is primarily recreational and roads will be private the main impact will be on fire and police protection. An increased demand on these services can be expected."

The services that will be most affected are roads, fire protection and police protection. At present, legal and appropriate access has not been secured. The volunteer fire department has no taxing authority and if they do not receive donations from the subdivision it will burden their services. The Sheriff's Dept. needs to come from Polson to provide law enforcement and protection. No information has been submitted which indicates that electric and telephone service is available to the project within a reasonable period of time.

It is difficult to assess whether the increase in taxes generated from the development will offset the cost of providing local services. A discussion of local taxes follows in the next section.

V. Effects on Taxation.

A. Existing and projected tax status.

The current and projected tax status are outlined in the tables below:

Current taxes (1983)

| | Taxable value | Taxes |
|--------------------|---------------|-------------------|
| 10 acres lakefront | \$8,550.00 | - |
| 56 acres timber | 124.00 | - |
| | | <u>\$1,487.00</u> |

Projected taxes (estimated)

| | Taxable value | Taxes |
|---|---------------|-------------------|
| Subdivided into 61 lots | \$ 33,700.00 | <u>\$5,733.00</u> |
| Subdivided into 61 lots with \$75,000. home on each | 210,027.00 | <u>35,900.00</u> |

At full development with homes on each lot, and based on the 1982 levies; the \$35,900.00 would be distributed to taxing jurisdictions as follows:

| | |
|------------------------|-------------|
| Roads: | \$ 3,165.00 |
| General fund: | \$ 8,351.00 |
| Local School district: | \$ 5,664.00 |
| General School fund | \$16,208.00 |
| Planning: | \$ 422.00 |
| Others: | \$ 2,090.00 |

The taxable value on the property will not change from its current status until such time that lots are placed on the market for sale. If the developer can demonstrate that his property is not as valuable as the assessment due to such things as not being able to sell them within a 5 to 10 year period, then he may be eligible for a developers discount of 30 to 50 percent of taxable value.

B. Conclusion.

As can be seen, the taxes on the property will increase if it is subdivided. The taxes on the land will increase approximately \$4,000.00 from the present status. The significant increase in taxes will occur once homes are built on the lots. At that time taxes will increase approximately \$ 34,000. from the present status.

It is generally accepted that residential development does not pay its own way in relation to its demand on services. Commercial and industrial development are the large taxpayers that offset this imbalance. However, recreation home development is considered to be more in balance with the tax-service relationship because people do not live in the area year round and do not place as large a demand on school services.

In light of the tax status, it appears that the local services that will be most affected will be the road department and Sheriff's department. The Sheriff's main source of funding is out of the general fund. The estimated taxes at full development will probably not cover the costs of these services, especially if the county has to accept more roads for maintenance, and the Sheriff is burdened by problems in the area.

If the county is responsible for re-building the main access road to the development to provide adequate access, the cost will far exceed projected road revenues from this project for many years to come.

VI. Effects on Wildlife and Wildlife Habitat.

A. Existing habitat

The area is mapped as white-tail deer winter range by the State Department of Fish, Wildlife, and Parks. There are also existing osprey nests and active osprey in the area.

B. Analysis of impact.

The major osprey nesting sites are located in the north portion of the natural area. The developers have proposed a covenant to address wildlife protection which states the following:

"It is well known that upon the premises in the designated wildlife buffer area Osprey rookeries and nesting sites are present. No owner shall permit any persons nor shall they interfere, molest, harm or harass these birds or their offspring. All owners shall exert their best efforts to minimize human/animal interactions of any sort on the premises."

They also have proposed a covenant on animals and pets which states the following:
"No animals or fowl, domestic or wild, except cats, dogs or household birds, such as canaries, may be kept on any of the properties or in any of the structures thereon, and in no event may any animals or fowl be raised or cared for on a commercial basis, or to become a nuisance to the neighbors. Any dogs must be contained in their own yard or on leash when outside. Vicious, barking, or howling dogs or animals shall not be kept or maintained on any lot at any time."

The staff has received a letter from the Dept. of Fish, Wildlife, and Parks concerning the proposal (Exhibit E). He states that osprey appear to be quite tolerant of human activities that are nearby and not directed at them. Since the major nests are located in the designated natural area and if the covenant is enforced to limit activity in this area, the staff feels that the impact on the osprey should not be significant and they will remain in the area. Also, if pets are controlled, the impact on the deer should not be significant.

In conclusion, the staff finds that the proposal will not have a significant adverse impact on wildlife.

FOOTNOTES

- 1 Onsite Wastewater Treatment and Disposal System, Environmental Protection Agency Design Manual, p. 100.
- 2 Kinetic Model for Orthophosphate Reactions in Mineral Soils, Bledsoe, Bert E., et al, Environmental Protection Agency, Publication 660-2-75-0222, June 1975.
- 3 Montana Earthquakes, 1869-1979, Historical Seismicity and Earthquake Hazard, Montana Bureau of Mines and Geology, Montana College of Mineral Sciences and Technology, p. 9.
- 4 op. cit., Appendix A, p. 18.

BIBLIOGRAPHY

1. Clark, John W.; Viessman, Warren Jr.; Hammer, Mark J., Water Supply and Pollution Control, 3rd Edition, 1977, Thomas Y. Crowell Co., Inc.
2. Enfield, Carl G.; Bledsoe, Bert E.; Kerr, Robert S., Kinetic Model for Orthophosphate Reactions in Mineral Soils, EPA 660/2-75-022, June 1975
3. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, An Economic Assessment - Final 1982, Montana Department of Administration, May 15, 1982.
4. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, A Comprehensive Annotated Bibliography on the Flathead River Basin, David B. Rockwell, 1982.
5. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, Flathead River Basin Environmental Impact Study - Final Report, June 30, 1983.

6. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, Fiscal Impact Assessment - Final 1982, Montana Department of Administration and Western Analysis, Inc., April 1982.
7. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, Perspective on Fisheries Study, Patrick J. Graham, Montana Department of Fish, Wildlife and Parks, January 1980.
8. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, Recreation and Preservation Valuation Estimates for the Flathead River and Lake System, Ronald J. Sutherland, December 30, 1982.
9. Environmental Protection Agency, Flathead River Basin Environmental Impact Study, Sediment Geochemistry of Flathead Lake, Montana, Johnnie H. Moore, Jaswant Singh Jiwan and Christopher J. Murray, Department of Geology, University of Montana, 1982.
10. Qamar, Anthony I and Stickney, Michael C., Montana Earthquakes, 1986-1979: Historical Seismicity and Earthquake Hazard, Montana Bureau of Mines and Geology, Montana College of Mineral Science and Technology, 1983.
11. Schmidt, Curtis, J.; Boyle, William C.; Clements, Ernest V.; Otis, Richard J.; Bauer, David H. Siegrist, Tyler, Stewart, Convers, Onsite Wastewater Treatment and Disposal Systems, U.S. EPA, October 1980.